

CPU

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Q&A With The
Mastermind
Behind C++
**Bjarne
Stroustrup**
(page 108)



* **Falcon**
Northwest Mach V
(2.53GHz)
Back On Top
(page 33)

64-Bit
Computing
On The Desktop
(page 46)

* **Tactics**
For Tweaking
Microsoft
Windows xp
(page 66)

From Our Columnists

- NVIDIA's Cg: A New Hope
- Preparing For Prescott
- Before Xbox
- Showing Off
- Software Just For The Shutterbug
- Home-Grown Linux
- Web Visual Design Strategies
- audiotrn.txt
- Future Game Developers

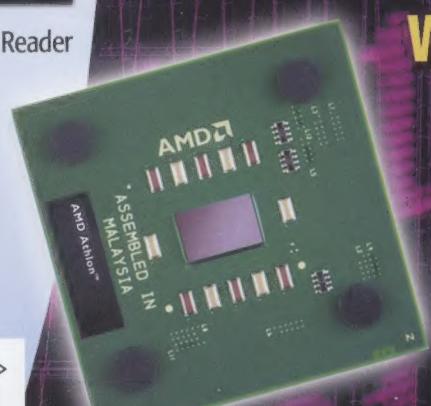
Hardware Reviews

- Memorex Universal Card Reader
- Palm m130
- Belkin USB 2.0 Computer Upgrade
- Intel 845G Chipset

August 2002
\$5.95 U.S. \$7.95 Canada



High Tech Takes To The Highway
(page 52)



Technology That Rocks

PC Challenge
\$1,000 College Systems. We Build Our Own
(page 40)

What's Happening In PC News

How To Spot Fake RAM
(page 6)

Bleeding Edge Of Software

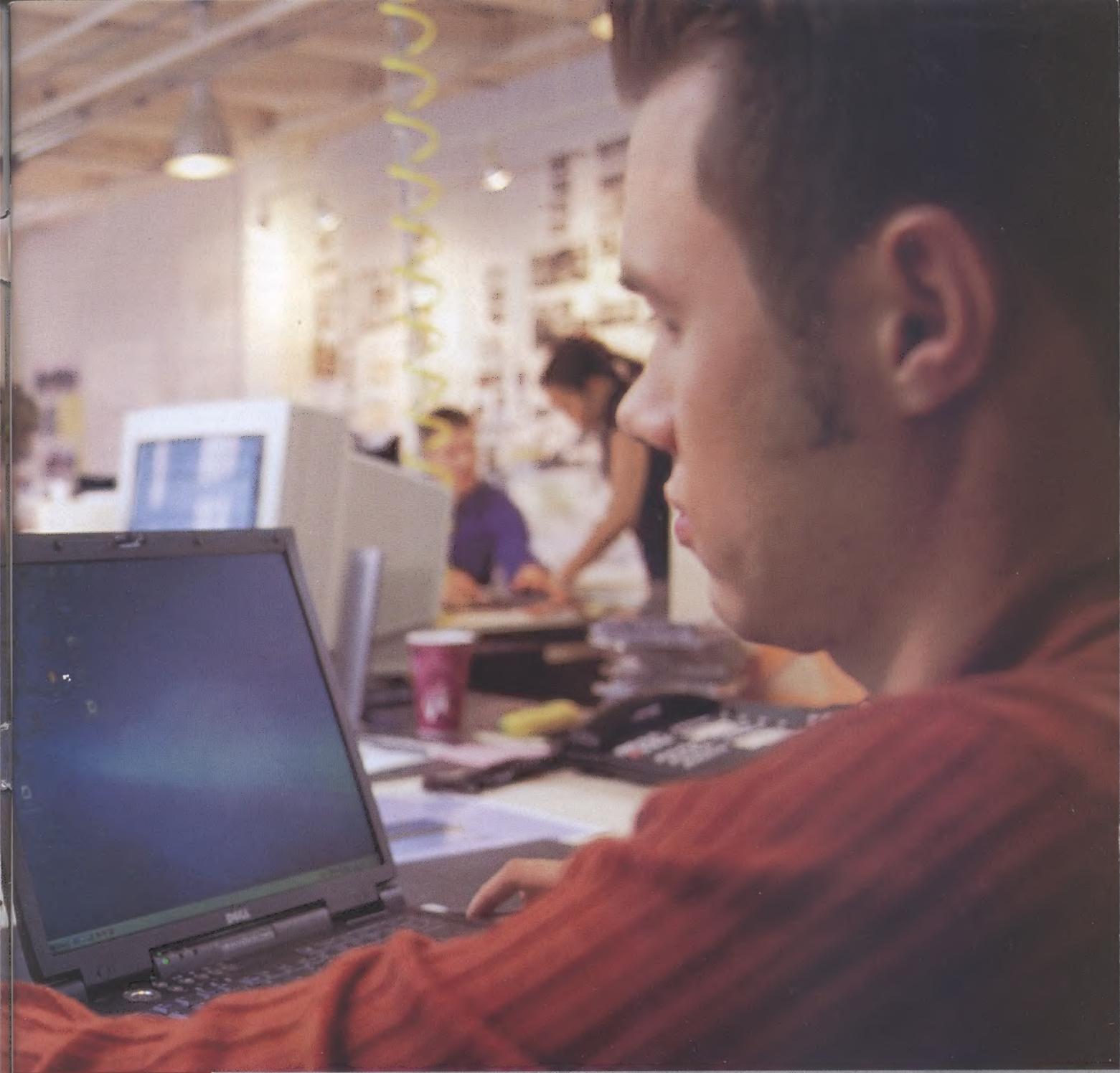
Netscape 7.0 Preview Release 1
(page 65)



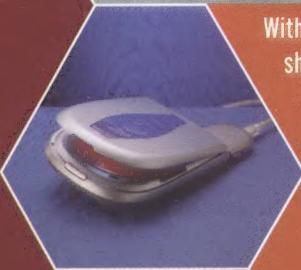
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SMART CARS

Spotlight

52

Smart Cars

The Technologies That Will Change The Way You Drive

56

The Ultimate Driving Technology

BMW's iOpener

60

Gear Up Your Rod

Technology For Your Car

Web

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Frontside

- 6 What's Happening
- 12 Digital Economy
- 13 The Saint
- Before Xbox

The Experts



Joan Wood
Forward Slash
page 86



Kyle Bennett
[H]ard Talk
page 38



Alex "Sharky" Ross
The Shark Tank
page 37



Alex St. John
The Saint
page 13



Rob "CmdrTaco"
Malda
**The Department
Of Stuff**
page 85



Lisa Lopuck
Site Scene
page 84



Anand Lal Shimpi
Anand's Corner
page 36



Chris Pirillo
Dialogue Box
page 73



Pete Loshin
Open Sauce
page 74



Heavy Gear

- 16 **Extreme Hardware**
These Gizmos Don't Sing It, They Bring It
- 18 **A Hodgepodge Of Budget Digicams**
Six Funky Models At Friendly Prices
- 26 AMD "Thoroughbred" Athlon XP 2200+
- 27 Intel 845G Chipset
- 28 Belkin Hi-Speed USB 2.0 Computer Upgrade Kit
Leadtek WinFast A250 TD
- 29 Palm m130
Canon CanoScan N676U
- 30 Memorex Universal Card Reader
TDK veloCD 24X/10X/40X CD-RW USB 2.0
- 31 Leica DIGILUX 1
Fujifilm FinePix F601 Zoom
- 32 Memorex RF5700
Memorex RF ScrollPro Optical Mouse
- 33 Falcon Northwest Mach V
- 36 **Anand's Corner**
Preparing For Prescott
- 37 **The Shark Tank**
NVIDIA's Cg: A New Hope?
- 38 **[H]ard Talk**
Showing Off



Hard Hat Area

- 40 **The PC Challenge:** Best College PC For Less Than \$1,000
- 42 **Swappin' Parts**
There's A Transformation Taking Place
- 44 **X-ray Vision:** XML: The Heart Of .NET
- 46 **White Paper:** 64-Bit Computing For The Desktop

Loading Zone

- 64 **The Bleeding Edge Of Software**
Inside The World Of Betas
- 66 **The Tweak Is On**
Four Apps That Will Help Make XP Your Own
- 68 **Snappy Snaggers**
Apps To Grab Your Screen Shots & More
- 70 321 Studios DVD Copy Plus
- 72 RealNetworks RealOne Player
Trend Micro PC-cillin 2002
- 73 **Dialogue Box**
Software Just For The Shutterbug
- 74 **Open Sauce**
Home-Grown Linux
- ▲ zTrace Technologies zTrace Gold
[Web Only]
- ▲ Watch Movies From Around The World
[Web Only]



Caught In The Web

- 76 Fringe
- 78 **MP3.com**
The Long & Winding Road
- 82 **Coder's Corner: XML**
Programming & XML, Part 2: Parsers & The DOM Interface
- 84 **Site Scene**
Web Visual Design Strategies
- 85 **The Department Of Stuff**
audiotrnx.txt
- 86 **Forward Slash**
Future Game Developers



Digital Living

- 88 **Road Warrior**
Good Names & Technology, Merger Island,



Tunes Via Phone & More From The Mobile Front

- 90 **At Your Leisure**
Plug In, Sit Back & Fire Away



Tips & Tricks

- 94 **Software Tips & Projects**
PC ER: Boot To CD
- 98 **Warm Up To Penguins**
Get Up To Speed With Your Command History
- 101 **Killer Hardware Tips**
Too Cool To Follow Rules

What's Cooking

- 103 **Technically Speaking**
An Interview With Dr. Kevin C. Kahn, Intel Fellow, Corporate Technology Group & Director, Communications & Interconnect Technology, Intel Labs
- 106 **Under Development**
A Peek At What's Brewing In The Laboratory



Back Door

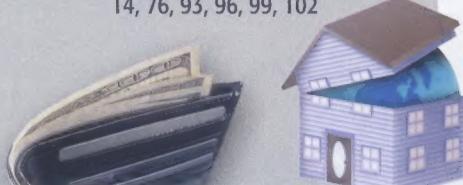
- 108 Q&A With Bjarne Stroustrup



Infinite Loops

Strange stats and other oddball items from computing's periphery.

14, 76, 93, 96, 99, 102





GREETINGS FROM SAMITLAND

Greetings folks. Welcome back to another episode of *Computer Power User*. This month in our Spotlight section (page 52), we get behind the wheel of a topic that might catch a few of you off guard: Smart Cars. "Now what the bloody hell do you think cars have to do with computers?" I hear some of you wondering. If you're like us, you hate leaving your computer technology at home. You probably want technology with you everywhere you go—and integrated more tightly than carrying around a notebook or PDA.

You'd be surprised (well, knowing you lot, probably not *that* surprised) how prevalent computer technology is in cars today. If the experts we talked to are even remotely close, you may not even recognize the cars of tomorrow. For example, my pulse started racing when I saw the Lexus MAGLEV in "Minority Report," but even more exciting is the fact that it's not (quite a) fantasy: In a few years, we may be driving cars just like it. Do you realize that the ultra-high-tech BMW 745i actually features PC force-feedback technology in the form of Immersion (www.immersion.com) in the iDrive? Surprises like that abound, and we thought we'd tackle computer technologies in today's cars. I think you'll like what you read. As for myself, I managed to buy a PhatBox right before PhatNoise started licensing its technology to Kenwood for the Music Keg. I'm impressed with the voice interface in the cockpit, and there's something intrinsically cool about having a mini-Linux server in the trunk with a 30GB hard drive for digital audio tracks.

In other sections in the mag you'll find the usual goodness you so love. We dissect .NET, study 64-bit computing for the desktop, modify boot logos, and create bootable CD-Rs, just to name a few of the numerous items in this month's issue. We're fast approaching our 1-year anniversary; if there are changes you'd like to see for year two, please shoot me an email and let me know. I look forward to seeing you again next month.

Samit G. Choudhuri, Publication Editor, *CPU*



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CORRECTIONS • July CPU, page 103

The section "Is modifying a DVD player legal? Taylor, who is not a lawyer, believes not" should have been printed as "Is modifying a DVD player legal? Taylor, who is not a lawyer, believes so."



Gotcha.
Here it is.

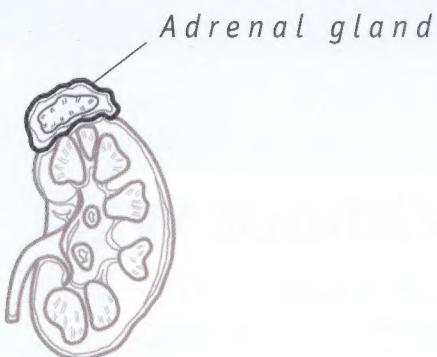


fig. 1



One essential piece of equipment for this game is in your body.

The other is in your computer.

A teeth-grinding adrenaline rush. A grenade-sized lump in your throat. The trigger-tingling sense that someone is watching you. It's all part of the over-the-top realism you'll experience in *Soldier of Fortune 2: Double Helix*. Why? Because this ultra-realistic game was designed for the optimum performance you can only get from a computer juiced with the high-speed performance of an NVIDIA® graphics processor. So plunge into the secret and deadly world of covert operations with the firepower of NVIDIA... and play the game the way it was meant to be played.



Visit your local CompUSA or log on to www.gamefixx.com/nvidia/



In Hardware . . .

Print Without Wires

3Com's Wireless Bluetooth USB Adapter now works with a parallel port adapter for cable-free printing.



It was only a matter of time before wireless printing hardware became available, and of course, the first offering isn't cheap. 3Com's Wireless Bluetooth Printing Kit is now available for \$250 and includes the Wireless Bluetooth USB Adapter and the Wireless Bluetooth Parallel Port Printer Adapter. Additional USB or PC Card adapters are sold separately for \$149.

The kit is Bluetooth 1.1-compliant and lets you send data to a printer while roaming as far as 32 feet away. 3Com assures the product is firmware upgradeable via download whenever new features arrive. See page 89 of this issue for more information. ▲

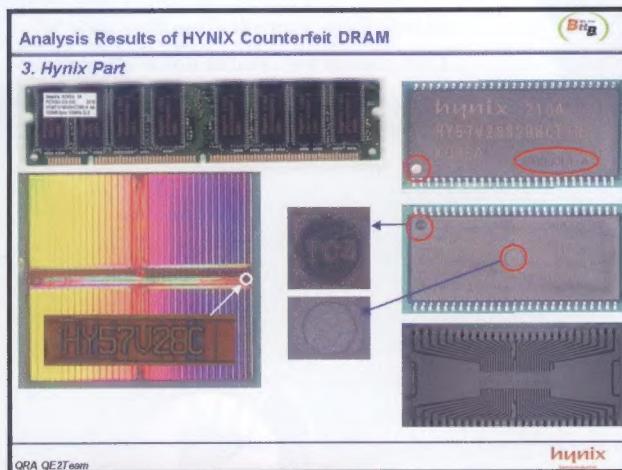
Beware The Bad RAM

We've all heard of counterfeit cash, Rollex watches, and pirated CDs, but fake RAM? Apparently counterfeit Hynix Semiconductor DRAM modules have been showing up in Europe, China, and Taiwan, and the manufacturer wants you to

know the difference before the faux parts hit U.S. shores.

So far, the counterfeit modules have all been found in made-in-Taiwan packaging and have been made to look like Hynix 128MB, 133MHz SDRAM modules. The labeling is usually an imperfect copy of Hynix's own, and the die is inferior to

Hynix's high-performance version. Look closely before buying or using (see photo), as there's little else to distinguish the good from the bad. ▲



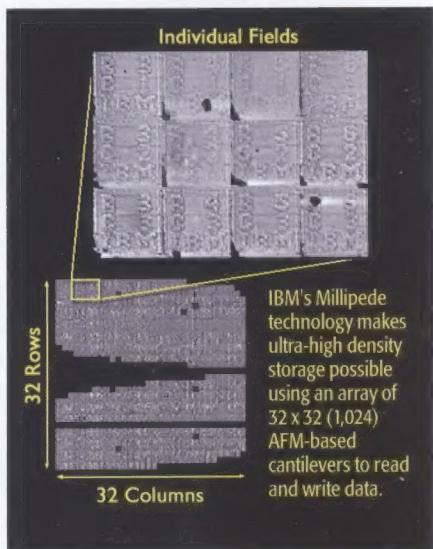
Here's the real McCoy:

A Hynix component with an authentic Hynix part number on-die.

IBM Leaps Toward Quantum Punch Card

IBM's Zurich Research Laboratory recently unveiled a new AFM (atomic force microscope)-based, punch card-style data storage technology. Code-named Millipede, the technology bodes as a promising alternative to magnetic storage. The technology's hardware debut took the form of an approximately 1-inch square piece of plastic containing around 3 billion 10nm indentations punched by a similarly sized thermomechanical puncture device with an AFM tip. It holds about one terabit (or 128GB) worth of data.

Reading data on Millipede-based media involves thermomechanical sensing, whereby the same AFM tip used for writing data is heated just enough to determine resistance on different areas of the media (and thereby read data) without melting the media. The AFM tip heats up to 400 degrees to do the writing and stays at around 100 degrees to do the reading. According to IBM, Millipede-based memory chips are rewriteable, ideal for low-power computing (think mobile devices), and should be available in 2005. ▲



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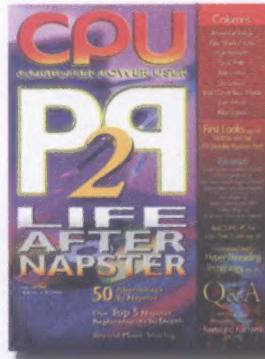
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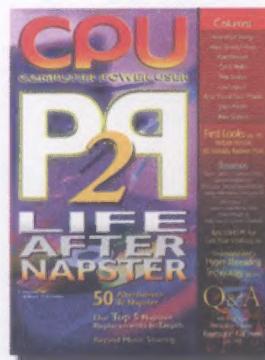
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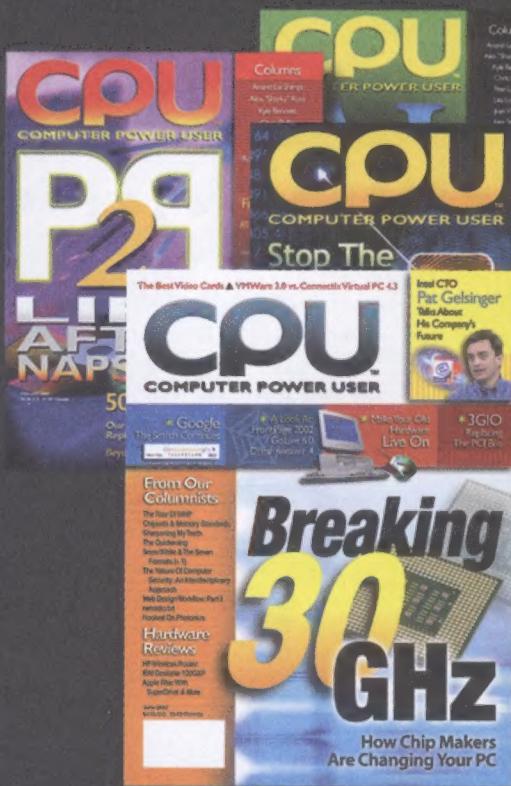
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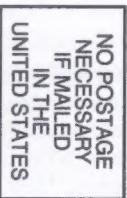
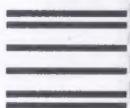
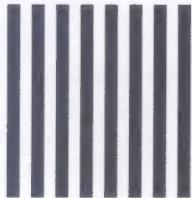
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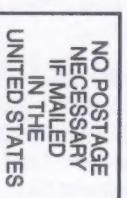
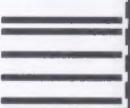
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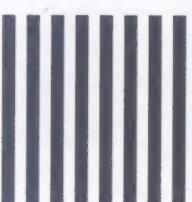
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Hardware Mole

Here are a handful of morsels our hardware mole unearthed before press time.

Flex Time

Last month, we reported that OLEDs (organic light-emitting displays) might give LCDs a run for the money in terms of flexibility and low power consumption.

However, Toshiba has stuck with LCD technology, the display technology it knows best, and has produced the first large-screen flexible LCD. Measuring 8.4 inches diagonally, the new active-matrix LCD is curvable (foldability is a future goal), consumes little power, and supports a SVGA (800 x 600) resolution. According to Toshiba, commercial products such as public displays (think bus stop ads) and curved TV screens could be available as soon as 2004. ▲



Toshiba's incredibly slim, large-screen polysilicon LCD clears the way for flexible screens Gumby would love.

ARM Makes New Friends

ARM-powered microprocessors have made their way into just about every category of electronic device, including everything from consumer gadgets to enterprise-level networking and storage products. Now ARM is teaming with Imagination Technologies and Superscape to bring a triumvirate of 3D know-how to handheld devices such as mobile phones and PDAs. In other news, ARM is working on a new processor called ARM11 and based on the company's Jaguar architecture. ARM11 chips will reportedly bring approximately 1GHz processing speed to PDAs. If the company stays on schedule, PDAs using ARM11 should start showing up late this year. ▲

Infiltration Via Gummi Bear

It's finally been done. According to Bruce Schneier, founder and CTO of Counterpane Internet Security, Japanese cryptographer Tsutomu Matsumoto recently created a fake finger that had an 80% success rate in thwarting a biometric fingerprint reader. To create the fake finger, Matsumoto poured a Gummi Bear-like gelatin solution into a plastic mold of a real finger. The entire endeavor cost about \$10. More interesting, however, is that Matsumoto was able to re-create a fingerprint left on a glass by taking a digital photo of it, printing it on a transparency, and using it as an overlay to etch the fingerprint into photo-sensitive PCB (printed-circuit board). The completed 3D finger also tricked the fingerprint reader 80% of the time. ▲

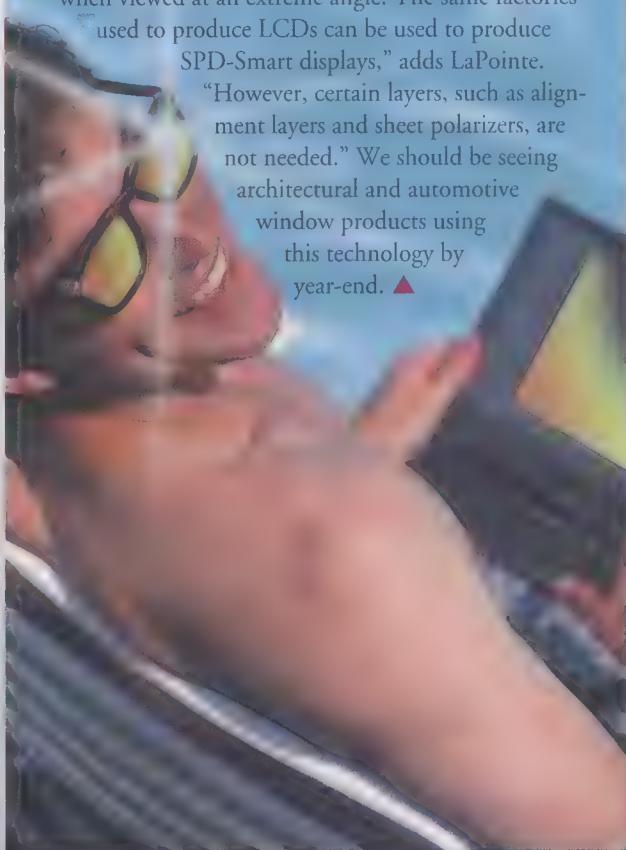
Smart Glass Gains Momentum

Remember when automatic sunglasses hit the shelves in the late '70s? Technology has come a long way since then, and Research Frontiers is now developing "smart" glass based on its SPD-Smart display technology that controls light transmission for various applications, including sunglasses, goggles, sunroofs, televisions, and windows.

According to Michael LaPointe, vice president of marketing for Research Frontiers, the company is also developing flat-panel displays to compete with LCDs. In this area, the company has "achieved a contrast ratio of 845:1, and there is virtually no degradation even

when viewed at an extreme angle. The same factories used to produce LCDs can be used to produce SPD-Smart displays," adds LaPointe.

"However, certain layers, such as alignment layers and sheet polarizers, are not needed." We should be seeing architectural and automotive window products using this technology by year-end. ▲



To continue the tradition established way back in July 2002, we bring you a page of the choicest chip news. Enjoy!

Infineon Creates Wiring For Future Chips

The technology for fabricating chips after the year 2010 doesn't yet exist. But Infineon Technologies, a Munich, Germany-based superpower in semiconductor development, has proven that today's integrated circuit wiring can be extended onward through 2009. Infineon's Munich Research Labs recently demonstrated that electrical lines can be shrunk below the standard 130nm to widths as small as 40nm. According to Infineon, 55nm should be the norm by 2010.



Infineon has proven that today's standard circuitry can be significantly reduced in size.

AMD Introduces MirrorBit

Advanced Micro Devices recently unveiled its new MirrorBit architecture, which extends Flash memory size while maintaining quality performance levels and reducing cost. 64Mb versions will be available by the time you read this; 128Mb and 256Mb versions are scheduled for release later this year. AMD claims it can reduce cost by using a smaller die with a simplified, symmetric layout. In terms of performance, AMD used page buffers and believes write performance will improve read and write speeds by 50%.



AMD's MirrorBit family includes (clockwise from top left) the 56 TSOP, 63-Ball FBGA, and 64-Ball FBGA.

VIA Makes A New High-Performance P4 'Board

VIA Technologies recently released its new P4PB Pro motherboard to support Intel's Pentium 4. VIA built the P4PB around its Apollo P4X333 north bridge and VT8235 south bridge chipset, making it the latest high-performance motherboard made for the Pentium 4. The P4PB accommodates a 400MHz or 533MHz FSB and DDR333 SDRAM, which has a 167MHz clock and provides 2,700MBps DDR memory. The 'board also has integrated USB 2.0 and FireWire support and integrated six-channel Surround Sound. Pricing information wasn't available at press time, and we could not locate the P4PB at the usual VIA resellers. However, the motherboard is now available, and by the time you read this, pricing information should be available at www.via.com.tw.



VIA's Apollo P4X333 and VT8235 chipset.

Watching The Chips Fall

Here's a rundown of the latest AMD and Intel CPU pricing information compared with initial release pricing.

CPU	Released	Original Price	Current Price
AMD Athlon XP 1500+	10/09/2001	\$130	\$82*
AMD Athlon XP 1600+	10/09/2001	\$160	\$130
AMD Athlon XP 1700+	10/09/2001	\$190	\$157
AMD Athlon XP 1800+	10/09/2001	\$252	\$180
AMD Athlon XP 1900+	11/05/2001	\$269	\$220
AMD Athlon XP 2000+	01/07/2002	\$339	\$280
AMD Athlon XP 2100+	03/13/2002	\$420	\$336
Intel Pentium 4 1.4GHz	11/20/2000	\$644	N/A*
Intel Pentium 4 1.5GHz	11/20/2000	\$819	\$133*
Intel Pentium 4 1.6GHz	04/23/2001	\$294	\$123*
Intel Pentium 4 1.7GHz	04/23/2001	\$352	\$141*
Intel Pentium 4 1.8GHz	07/02/2001	\$562	\$163*
Intel Pentium 4 2GHz	08/27/2001	\$562	\$196*
Intel Pentium 4 2.2GHz	01/07/2002	\$562	N/A*
Intel Pentium 4 2.4GHz, 400MHz FSB	04/02/2002	\$562	\$386*
Intel Pentium 4 2.26GHz, 533MHz FSB	05/06/2002	\$423	\$423
Intel Pentium 4 2.4GHz, 533MHz FSB	05/06/2002	\$562	\$562
Intel Pentium 4 2.53GHz, 533MHz FSB	05/06/2002	\$637	\$637

*No longer in production. Price, if indicated, is lowest available through Pricegrabber.com.

Internet . . .

Xbox + Broadband = Xbox Live

Too powerfully addicted to your PC to spend any serious time offline playing with an Xbox? Microsoft is counting on folks like you to make its Xbox Live fly off the virtual shelves.

This summer Microsoft unveiled Xbox Live, an online gaming service that'll set you back \$49. The service includes an online ID, an Xbox version of a buddy list that lets you invite your online peers to join you in a game, and a handful of options intended to adapt the Xbox experience to the Internet. Beyond that,

Xbox Live mainly leverages what the Xbox has: Integrated voice communication and a hard drive. However, Xbox Live is a broadband-only proposition: No dial-ups allowed.

All this has brought good news to the financially ailing Japanese version of the Xbox.

The Japanese version of Xbox Live, which is pretty much identical to the U.S. version, debuted this summer. Reportedly, reception has been overwhelmingly positive, and 47 games are in the design phase for the Japanese Xbox Live network.

We'll have to wait and see how many U.S. Xboxers are willing to pay for Xbox Live and the free game that comes with it, ReVolt. Sony and Nintendo have already worked out what Microsoft will perceive as a monkey wrench: A \$39.99 Internet connection kit for PlayStation, which accommodates both broadband and dial-up, is due out in August; and a \$34.95 dial-up modem adapter for the GameCube is scheduled for release this fall.



BIOS Upgrades Available Online

Before you send another motherboard to the landfill, consider upgrading the BIOS and giving your PC a new outlook on life. Here are a few recently released upgrades. Check out www.smartcomputing.com/cpumag/aug02/bios to see the entire upgrade list.

Manufacturer	File (Date Available)	URL
Gigabyte	7DX+_F6 ver. F6 (05/31/2002)	www.giga-byte.com/support/support.htm
Gigabyte	8IDX_F8 ver. F8 (05/20/2002)	www.giga-byte.com/support/support.htm
Gigabyte	8IDXH_F9 ver. F9 (05/16/2002)	www.giga-byte.com/support/support.htm
Gigabyte	8IEMLT_F1 ver. F1 (05/17/2002)	www.giga-byte.com/support/support.htm
Gigabyte	8IGMLT_F1 ver. F1 (05/17/2002)	www.giga-byte.com/support/support.htm
Gigabyte	8IHXP_F1 ver. F1 (05/24/2002)	www.giga-byte.com/support/support.htm
Gigabyte	8ILMT4_F1 ver. F1 (05/20/2002)	www.giga-byte.com/support/support.htm
Gigabyte	8SIML_FC ver. FC (05/15/2002)	www.giga-byte.com/support/support.htm
Gigabyte	8SRX_F8 ver. F8 (05/15/2002)	www.giga-byte.com/support/support.htm
Gigabyte	8SR533_F2 ver. F2 (05/17/2002)	www.giga-byte.com/support/support.htm

New On The 'Net

Looking for some new surfing destinations? Here's a sampler of the many sites that recently hit the Web.

Heard About NerdHeard?

Getting carpal tunnel from using search engines all day? You could try www.nerdheard.com. NerdHeard bills itself as "the Web's foremost information auction." Its concept, which involves posting a question along



with a price you're willing to pay for an answer, might fall flat, but it's definitely a novel idea. Knowledgeable folks take their turn in the question-and-answer process by explaining their qualifications and making a bid. If accepted, they have from four to 48 hours to provide an answer. Sign-up includes \$1 off your first question and a bumper sticker. ▲

Free Web Hosting Locator

Hopefully this time the good guys won't finish last. The good guys in this case are the folks behind [FindMyHosting.com](http://www.findmyhosting.com), an ad-free, no-charge service that helps put you in touch with the right company to host your Web site. The site includes a search tool and a point rating system that's based on customer feedback. Plus, if you need to learn more about the topic, the site has links to articles about Web hosting and a glossary. ▲

Boxers, Not Briefs

If you're one of the 43 million Americans who the Census Bureau says will move this year, quit scrounging for boxes and check out www.boxbundles.com. BoxBundles.com offers wholesale-priced moving kits that include labels, tape, packing paper, bubble wrap, and more. As long as the company doesn't go the route of failed etailers by venturing into also selling boxer shorts and boxer dogs, it looks like it's got a good thing going. ▲

In Software . . .



A new SDK lets you program AIBO as you see fit.

Gahahaha! Sony Does About-Face, AIBO Gains Control

Until recently Sony has put up the armor and done battle with developers trying to teach AIBO how to perform tricks that don't exist in the Sony-programmed repertoire. But now that Sony released a development kit, OPEN-R SDK, for exactly that purpose, the sky's the limit. (Actually, the ground's the limit unless you can teach AIBO to fly.)

Because both the AIBO hardware and the OPEN-R SDK software are modular, it's supposed to be relatively easy to swap and add capabilities. Theoretically, with a little C++ knowledge, you could even program your AIBO to shriek and throw itself down the stairs whenever the tuned-in classic rock station starts blaring Heart's "Barracuda."

System requirements are hardly worth mentioning (233MHz Pentium, 64MB RAM, you get the idea), but you must use the AIBO Programming Memory Stick to load your new tricks, as ordinary versions won't work. By the time you read this, OPEN-R SDK will be available for download from AIBO's home page (www.jp.aibo.com). ▲

French Fried Microsoft

Perhaps you, like most of the world press, didn't notice that Microsoft was convicted of software piracy late last year. First reported in the Paris newspaper *Le Monde Informatique*, the Commercial Court of Nanterre in France convicted Microsoft of pirating Softimage|3D, French-made graphics animation software, and fined the company 3 million francs (approximately \$430,688).

The verdict came down on Sept. 27, 2001, but litigation dates back to 1995, when Microsoft acquired the French company Softimage, which had already been cited for an intellectual property offense against another French software company. Although Microsoft claimed to have cleansed the Softimage|3D software of pirated functionality, eight features allegedly remained; for this, the court finally ruled against Microsoft. So far, Mr. Gates has commented neither on the ruling nor on whether he enjoys ketchup with his fries. ▲

Freestyle, Microsoft Style

Have a DVD drive, a 2GHz CPU, 256MB of RAM, and a desire to turn your WinXP box into a multimedia jukebox? Then prepare to lay down some cash when Microsoft releases Freestyle later this year. Microsoft is being characteristically quiet about specific pricing and a release date; even the Freestyle moniker might turn out to be just a description of the technology and not the product itself. However, Microsoft now has a preview on its site, so the tease is on.

According to MS, WinXP is already nearly perfect ("Windows XP . . . gives you the freedom to create, manage, and experience more than you ever thought possible with your computer and the Internet"), but the company is tossing Freestyle into the ring to provide greater mobility when using WinXP.

Freestyle provides a remote control and a new, WinXP-style interface that lets you organize your music, video, and picture files visually. It also lets you hook up your television, a feature that foreshadows Bill Gates' announcement earlier this year that in the not-too-distant future, users will be able to access files on their WinXP PC via a television set anywhere in the house.

Freestyle will essentially let you turn your PC into a digital media jukebox: Select audio tracks, albums, DVDs, photos, and such; adjust the volume; and even make digital video recordings from television or other input, all via remote. But before you drop a grand on a standalone jukebox, you might want to find out what goods Freestyle actually delivers. ▲



Freestyle's interface can be full-screen or not, and it lets you easily sort out your audio/video selections.

Calling All Digital Animation Freaks

You know who you are. You've seen "Star Wars Episode II: Attack Of The Clones," "The Lord Of The Rings," and "Spider-Man" five times each "because your friends dragged you there." Right. If you enjoyed those flicks that much, you might already know that animators used Alias|Wavefront's Maya software to create hundreds of 3D animation effects for these and many other films. Maya has also been used for video game, automotive, and medical applications.

Now Alias|Wavefront is offering the Maya Personal Learning Edition for students, amateurs, or pro 3D animators who would like a taste of Maya's power. The Maya Complete edition the studios use runs



\$1,999; the PLE is free via download, no webs (er, strings) attached, and it includes all the Maya Complete toolsets. The PLE works with WinNT(SP4)/2000 Pro/XP and Mac OS X; overall system requirements aren't too steep, but you need at least 512MB of RAM and a hardware-accelerated OpenGL video card. Visit www.aliaswavefront.com for details. ▲

Software Shorts

Sometimes all the news simply doesn't fit, but here are a handful of items we squeezed in.

IEEE 1394 Becomes FireWire

Last month we reported that Apple acquired Zayante, a company that manufactures IEEE 1394-compliant products. Now the IEEE 1394 Trade Association, which manages and promotes the IEEE 1394 standard, has sublicensed the FireWire brand, which means non-Apple IEEE 1394 products will also be dubbed FireWire. ▲



Microsoft Takes Sides With DVD+RW

There are two competing DVD-recordable formats; each format is incompatible with the other, but you can use either one to create DVDs that play in standard second-generation DVD players. Both formats already have a hefty set of backers, but Microsoft recently stepped in the ring by announcing it would back the DVD+RW format. The DVD+RW Alliance includes some of the biggest names in the PC biz: Sony, Dell, Hewlett-Packard, Philips, and Mitsubishi Chemical, to name a few. The DVD Forum, on the other hand, supports the DVD-R/RW/RAM formats and includes some equally heavy hitters, such as Acer, Hitachi, IBM, LG Electronics, and NEC. ▲

Time To Learn A New Graphics Language

Software giant Microsoft and graphics powerhouse NVIDIA recently announced their participation in a joint project: Cg, a new industry standard programming language for graphics developers. Cg, with roots in the C programming language, supports multiple platforms (Windows,

Linux, Mac OS X, and Xbox) and works with any programmable GPU that supports DirectX 8 or OpenGL 1.4 including, of course, the GeForce 3 and 4 and subsequent generations of NVIDIA GPUs. According to NVIDIA, Cg-based animation is destined to converge with cinematic-quality digital animation within the decade. Dozens of developers, including Electronic

Arts, LucasArts, Relic Entertainment, Sega, and Sony Online Entertainment, already endorse Cg. See page 37 of this issue for Sharky's take on Cg. ▲



nVIDIA.

Compiled by Steve Sotak

CLASSIFIED

THE
CLASSIFIED
SECTIONShader
Technical Director
Pixar Studios

I have spent 10 years at Pixar, so I brought in the relatively safe, fairly computer-generated "Toy Story" film and the somewhat less safe "Monsters, Inc." for testing for a few good frames to help train America's team for the next few Pixar movies coming out this year. Apparently, the world of big-time computer-generated film characters has begun to call for special software. Pixar is looking for a Shader Technical Director. According to the company's job posting, the Shader TD determines an animated object's color and how it reacts to light. But ultimately, you have to decide how a light reacts to a scene, will look when cast on characters, and how characters will interact with the scene in the Toy Story.

The job requires technical skills, experience with Pixar's RenderMan software and rendering, graphics programming. And, the resume must emphasize that you "will need to know RenderMan." From the sound of this post, you may also need the social ability to handle directly Web-savvy characters or animators who refuse much dialogue. According to the job description, the successful candidate will be able to work from theory to film a creative, yet explosive, and glorious rap battle, "but may also take the form of simple visual descriptions accompanied by curious handwaving." ▲

RAW DATA

167 million

Number of Chinese cell phone users, the largest mobile phone population in the world



52%

Percentage of Webizens in 2002 who will delete an email message from an unknown sender without opening it



92%

Percentage of IT workers who worked for non-IT companies in 2001

Information Technology Association of America

2,039,880

Number of software programmers in the United States in 2001

Information Technology Association of America

16 hours, 52 minutes

Average weekly time wired U.S. mothers spend online

Digital Marketing Service/AOL, April 2002



12 hours, 17 minutes

Average weekly time wired teens spend online

Digital Marketing Service/AOL, April 2002

100 petabytes

Amount of data traffic sent across the Internet in 2001 (1 petabyte equals 1 million gigabytes)

RHK

Hola, Señor Web!

It turns out that the U.S. Hispanic community is one of the fastest-growing ethnic segments on the Web. According to a survey comScore conducted, the population of wired Hispanics in the United States grew 19% to 14.5 million from the first quarter of 2001 to the first quarter of 2002. As of the first quarter of 2002, Hispanics make up 11% of the total U.S. Internet population. For a taste of Latino culture online and its size, check out MiGente.com, a Web community for Hispanics that boasts more than 600,000 members. At any given time of the day, more than 8,000 are posting, chatting, or scoping out content on MiGente. ▲

Trends In U.S. Online Population	Average Monthly Unique Users (millions)		% Change Q1 2002 vs. Q1 2001
	Q1 2001	Q1 2002	
Total U.S. Internet Pop.	125.4	137.0	7%
Non-Hispanic Users	111.2	117.5	6%
Hispanic Users	12.2	14.5	19%

Source: comScore (May 2002)

Before Xbox

I just read Dean Takahashi's new book, "Opening the Xbox." Naturally, once I learned that I was mentioned in it, I searched it diligently for all Saint-related references. This was my favorite quote: "I feel like there's a little bit of Alex in every Xbox that we're going to make." —J. Allard. I'm very flattered. Reading the book brought back a lot of memories about the precursor days of Xbox at Microsoft.

When I joined the empire way back in 1992, the 3DO was the great hope for a successful American game console. Back then Microsoft was all about getting the CD-ROM adopted as the standard data medium to the PC. Multimedia would be all the rage for the PC. It sounded exciting, but Microsoft's vision of multimedia was basically video content with limited interactivity (remember *Myst*?).

Microsoft was very influenced by Apple's leadership in this kind of multimedia at that time. I was an avid DOS gamer and found it mystifying that the highly popular and engaging PC games published for DOS were largely ignored while Microsoft devoted its energies to creating technologies and content with the Macromedia Shockwave kind of feel to it.

At one point, Microsoft's consumer division announced that they were going to publish 100 multimedia CD-ROM titles one year. Remember Julia Child's Wine Guide and Microsoft Dogs? How about BOB? If you ever wonder where that annoying paper clip in Word came from, it's all that is left of Microsoft's revolutionary BOB product.

One day I came to work and was confronted by a giant poster in the front lobby of a bull's-eye with a blue cartoon character with crossed eyes and lolling tongue exploding out of the center of it. The tag line was "McZee IS COMING!" McZee [see opposite page] was to be the leading character for all of Microsoft's upcoming children's titles. McZee looked remarkably like an asphyxiating pedophile you wouldn't want coming anywhere near your children.

Around the same time, Microsoft research, which had recruited many of the greatest minds in 3D graphics, was hard at work inventing next-generation 3D hardware acceleration for consumers. The project's code name was *Talisman*. In retrospect, the architecture was absurd, but at a time when the consumer 3D hardware business was still nascent, it was a deadly serious strategic effort at MS. Here's a quote from an original *Talisman* spec dated October 1995: "Even though the multimedia PC market is growing fast, the market for dedicated video games continues strong. In many cases these systems compete for customers with the PC. In cases where the customer is purchasing both a PC and a video game, these represent dollars that could be available to the PC market alone. Improving the PC's ability

to capture this entertainment market is one of the primary motivations for the *Talisman* project." Ironically, this was dated one month after we had shipped DirectX 1.0 for Windows 95. The battle for controlling 3D standards on the PC would ultimately be won by Direct3D.

Talisman was a great example of pre-Xbox thinking at Microsoft. That division of MS also had several set-top box initiatives underway, all efforts to design proprietary hardware to play interactive

video on a TV set. None of them bore much fruit, which ultimately led MS to acquire WebTV for half a billion dollars a few years later.

I had been hired to help evolve the Windows 95 and Windows NT printing architecture, but by late 1993 I had done everything I could for those OSes before their respective releases. I was intensely interested in gaming, and persuaded my management to make me Microsoft's first Game Evangelist. I immediately departed on a road trip to meet with the leading game developers at that time to find out what they needed from Windows to make it a great gaming OS. On this trip I met John Carmack at id, who gave me the source to *DOOM* to port to Windows; Richard Garriot at Origin, who later sent three engineers to



Alex St. John was one of the founding creators of Microsoft's DirectX technology. He is the subject of the book "Renegades Of The Empire" about the creation of DirectX and Chromeffects, an early effort by Microsoft to create a multimedia browser. Today Alex is President and CEO of WildTangent Inc., a technology company devoted to delivering CD-ROM quality entertainment content over the Web.

If you ever wonder where that annoying paper clip in Word came from, it's all that is left of Microsoft's revolutionary BOB product.



McZee Is Coming: Be afraid. Be very, very afraid. Visit members.tripod.com/~s9zq5r/sfx.htm to see these images, which were part of the site's Sick Ribbon Campaign To Ban Microsoft's McZee.

Microsoft to consult on the design for DirectX 1.0; Mindscape, where I first met Kevin Bachus; and Looking Glass, where I first met Seamus Blackley [see May *CPU*, pg. 108], as well as Activision, EA, and many others.

The primary feedback from that trip was "Windows is fat, slow and bloated; try to keep it out of our way, and make sure your DOS mode doesn't break our games." Thus we spent most of 1994 collecting hundreds of DOS games and trying to make them run reliably in Windows' protected mode—a feat achieved by one Raymond Chen, a Microsoft developer who belongs in the history books of the game industry for single-handedly putting DOS to death by patching over 1,000 DOS video games to run in Windows 95.

At the same time I was working with a small renegade group in the research division, which was working on a fast graphics API for Windows called WinG. We ported Doom to WinG and showed the game industry for the first time that it might actually be possible to achieve reasonable video performance for games inside the Windows OS. This led to a small flow of games for Windows 3.1 for the 1994 Xmas season . . . and the infamous Disney Lion King disaster that precipitated the creation of DirectX.

The Disney Lion King disaster started with Disney being persuaded that WinG could provide adequate video performance to justify making their latest children's title a Windows-only game. Naturally, we were very proud of ourselves . . . that is, until the post-Xmas edition of *The Wall Street Journal* featured a cover article with the headline, "Disney spoils Christmas for children everywhere." Compaq had shipped over a million consumer computers into the

distribution channel with broken Cirrus video drivers; Lion King had never been tested on them. On Christmas morning, children around the country opened their new Compaq Presarios, installed their new Lion King game, and were treated to a spectacular OS crash and blue screen. I don't care to relive the sordid details of what followed thereafter, but suffice it to say that Disney was not amused. I realized that if we really wanted Windows to be a serious gaming platform, we would have to devote more energy to it than just hacking together a faster graphics API that may or may not work reliably on most video hardware.

DirectX was conceived to be an operating system—a real-time OS that would live within Windows and whose primary function was to blot out the giant and cumbersome Windows OS, leaving only the core services that were useful for games. DirectX was called DirectX because it was also meant to provide direct access to low-level multimedia hardware services such as sound, graphics, the joystick, etc. It would provide a very thin veneer of abstraction on top of the media hardware, enabling game developers to use advanced hardware features in a standardized way, while allowing the hardware vendors relative freedom to compete with one another for better performance and architecture. The vast majority of the code in DirectX 1.0 was dedicated to preventing the Windows OS from trying to "add value" that would impact game performance while a game was running.

Two friends of mine (Craig Eisler and Eric Engstrom) who had also been evangelists at Microsoft moved to the systems group to build DirectX. The first specification for DirectX was presented to leading developers from the game industry in

November 1994. It was met with great interest and skepticism. We didn't have much support for our project at Microsoft. Although we reverently believed that DirectX would be the PC's answer to the onslaught of Japanese consoles entering the U.S. market, Microsoft had already placed its strategic bets elsewhere. Being young and short on political correctness, we called our effort The Manhattan Project and printed black T-shirts with neon green nuclear-blast mushroom clouds on them that read, "Microsoft Manhattan Project, Shall we play a game?" We adopted the radiation symbol as the logo for DirectX.

Later, as DirectX became widely adopted by the game community, we were forced to alter the logo . . . instead of being a neon green radiation symbol, it became a neon green "X." You'll find the descendant of that logo on your DirectXbox. ■

Share your thoughts with
TheSaint@cpumag.com

Infinite Loop

Ounce Of Prevention?

Antivirus programs comprise heuristic algorithms, TSRs, and updating utilities, but they're still mostly long lists of virus definitions. Check out the folder sizes of these fully updated AV installations:

Norton AntiVirus 2002 on WinXP Home: 12.4MB

Trend Micro PC-cillin 2000 on Win98: 39.9MB

Meanwhile, attachments of common threats are much tinier:

W32.Badtrans.B@mm: 29KB

W32.Nimda.A@mm: 57KB

W32.Sircam.Worm@mm: at least 134KB

While the saying goes that an ounce of prevention is worth a pound of cure, it appears that when it comes to computer viruses, you need up to 86 pounds of virus prevention to cure an ounce of virus.

Source: Symantec Security Response

COMPLETE DISASTER!



TOTAL RECOVERY

Just a moment ago things were going great. Your figures finally added up, that critical report was done and your MP3s were downloaded. That was then. Now you're looking at a blue screen on a dead machine.

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With an easy-to-use Windows® interface, Drive Image® 2002 allows you to quickly make a complete copy of your entire system onto a Zip®, Jaz®, CD-RW, network drive, disk partition or any other suitable storage device. So, when disaster strikes, all your valuable data is ready and waiting for you to put it right back where you left it.

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PROVEN SOLUTIONS FOR STORAGE MANAGEMENT

EXTREME HARDWARE

These Gizmos Don't Sing It, They Bring It

This month's Extreme Hardware lineup demonstrates three degrees of pet ownership. For those of you who lie awake nights wondering what sort of smart remark your basset hound made earlier in the day, perhaps the answer lies in a wireless dog translator. For those of you better at spending money than remembering to feed anything, there's the latest domestic spy/robotic pet from Sony. Finally, if you're the type who crawls blearily out of your game den, checks the calendar, and finds instead a Dear John note from your cat who's run away, why not take the next step with your very own arcade game or walk-in monitor?

by Marty Sems



XGAMING X-Arcade Universal Cabinet

Olllllllld school. MAME is all well and good for reliving your youth misspent playing vids in that seedy arcade next to the skating rink, but there's just something missing from the experience on a PC. Well, besides Heart singing "Barracuda," the sticky Coke spills on the carpet, and the gawking 8-year-olds hanging out near the crane because they blew through their allowances in 15 minutes. It's the feel of those nearly indestructible joysticks and buttons flying under your fingers like you're Yngwie Malmsteen. It's the feel of rolling Pac-Man's score counter after 10 hours of standing up without a bathroom break. Plop your computer or game console into XGAMING's ready-made X-Arcade Universal Cabinet (\$2,995.95; www.x-arcade.com), and you've got yourself a head-to-head time machine. This is a full-sized PVG/Semco/Hanaho arcade cabinet built to last with a 21-inch SVGA monitor and XGAMING's programmable X-Arcade dual-joystick controller. The X-Arcade controller is available separately for just \$149.95 to \$169.95, as are \$29 to \$39 adapters for the Xbox, PS2, GameCube, and others. You'll have to supply your own Buckner & Garcia music.



Hammacher Schlemmer 180 Computer Monitor

There's nothing like Hammacher Schlemmer's site (www.hammacher.com) to make you sit straight up and say, "Hey! Why don't I have an inflatable iceberg?" The hovercraft and three-man submarine for sale on the site looked like more fun, but we sort of felt obliged to report on the 180 Computer Monitor instead. (Hope we launch *Submarine Power User* soon. Or is the name *DOS Boot* too retro?) This odd-looking, 5-foot-tall monitor isn't new, but it may as well be the extremely nearsighted Mr. Magoo's. It projects the view from a 2-megapixel active-matrix LCD with 24-bit color depth on a curved screen, which could really put you inside your "Star Wars" star-fighter of choice. Big ain't cheap, though. This version is on the sunny side of 20 grand, although there's an 800 x 600 SVGA model for less than \$16,000. Hey, Rogue Leader, it's still cheaper than an X-Wing.

USMC Dragon Runner

We will bet you knew that your PlayStation 2 was somehow preparing you for modern warfare. Now all those hours you spent guiding remote-controlled trucks over plywood barricades and through culverts has paid off as well. The U.S. Marine Corps Warfighting Lab (www.mcwl.quantico.usmc.mil) is developing the Dragon

Runner, which is an insanely tough 4 x 4 with an infrared camera, microphones, and motion sensors. Marines can fling the 9-pound electric truck into combat zones, getting a visual recon of where the bad guys are hiding over a wireless signal—currently commercial UHF in the prototype stage—on the controller's 4-inch video screen. The Dragon Runner can act as a mobile spotlight at night for soldiers' infrared goggles and can even automatically backtrack if it loses its control signal. The Corps may officially roll them out in late 2004 for about \$3,000 each. The button layout of the Dragon Runner's control box resembles a PS2 game controller's, the Lab states. It's just one more way that the hobbies your mom thought were pointless were actually . . . career ed (or, vital to national security, vital to the fate of the free world. . . .)



Sony AIBO ERS-31L

In case your suburban neighborhood association won't let you have a real pit bull, you can still swagger around with the robotic equivalent. OK, Sony's new AIBO ERS-31L (\$599; www.us.aibo.com) may look more like cutesy AIBOs named something like Lettuce and Macaroni than the cooler Terminator-style ERS-210 and ERS-220, but the ERS-31L is still kind of neat. This one is a shutterbug. It enjoys scooting around your home, taking digital photos of whatever trips its trigger. Er . . . on second thought, that could be embarrassing in mixed company. At least it's better than piddling on whatever it finds interesting, like a real dog. The new AIBO also has new behaviors and dances, including a morning greeting (also sans piddling). Sony will be taking orders by the time you read this. And we were just kidding about the whole pit bull thing. Swagger at your own risk.

Takara Bowlingual

And here we always thought people liked dogs because dogs' emotions are so easy to read. That's not enough for Japanese toy maker Takara, inventor of the wireless Bowlingual dog translator (about \$119; www.takaratoys.co.jp/english/index.html). In case you're too dense to understand that insane, sudden, spastic barking means "total Armageddon" or "UPS guy" (they're the same word in doggie language), the Bowlingual can help you out with any of 200 phrases, such as "You're ticking me off!" Your dog wears a microphone gizmo on his collar, which sends his barks to your handheld translator. Bowlingual even keeps a Bow Wow Diary so you can know what your dog was barking about all day while you were at work. The question is: Would we lose respect for dogs if we knew they were just saying "Hey!" over and over? Dave Barry would have a field day with this toy. No, we don't know when you can buy one in the States. However, future plans from Takara include Bowlingual Mail, so your dog can email you at work, in all caps, of course: "SQUIRREL! HEY! YOU'RE TICKING ME OFF! OH YEAH!"



A Hodgepodge Of Budget Digicams

Six Funky Models At Friendly Prices

Certain engineering factors limit creativity when designing film-based cameras. Nothing could be further from the truth in the digicam realm, however, where size, case configuration, and features are limited only by an engineer's imagination.

So many cool new digital cameras emerge every year that it's tough to select a single outstanding product, especially when you're on a tight budget. We picked a wacky assortment of budget-priced cameras and subjected them to a number of standard tests to give you an idea of the performance and image quality you can

varies, but they're frequently easy to spot when you zoom in on high-contrast areas. In addition, we examine images for barrel distortion, which makes the center of the image look as if it's bulging outward.

Besides image quality, we observed other aspects of each camera. Speedy performance is a must. There's nothing worse than waiting for the flash to charge while the hottie next door evaporates behind those Venetian blinds again. Bundled accessories are worth analyzing, too, because investing in an inexpensive digicam gets expensive in a hurry if you have to buy batteries, a more capacious memory card, and camera case right after splurging on the camera itself.

Read on to see how these six cameras handled our tests.

Super-Small Digicams

Camera makers have an obsession with size. In the case of digicams, smaller is ostensibly better, to the extreme where a few cameras are so tiny that they're equipped with key chains to keep you from losing them. In spite of the generally poor picture quality these cameras capture, they're useful when you need a quick snapshot in a rough neighborhood where your \$3,000 SLR might draw the attention of a few too many bloodshot eyes.

Logitech Pocket Digital

When Logitech offered to smuggle a pre-production camera out of Communist China for us to review, we eagerly green lighted the operation. After all, the Pocket Digital wouldn't be that hard to slip past the guards; this MasterCard-sized camera is only 0.5-inch thick and is easy enough to stash in places where security would never look (and we would never want to think about).

At first sniff, this camera doesn't even look like a camera. From the front, it looks like a space-age pillbox, and the back has just a small monochrome LCD and two buttons. Pull the case on either side and things start to make



Pocket Digital

\$130
Logitech
(800) 231-7717
(510) 795-8500
www.logitech.com



expect from sub-\$500 digicams. We'll investigate these cameras in groups of two, starting with two tiny models.

How We Tested

We shot every camera indoors and out, taking multiple images under natural and artificial lighting. One of the most important factors we use to judge a camera's quality is the amount of noise, or digital interference, the camera's CCD produces in the final image. In cameras with sub-par CCDs, noise is readily apparent, making images appear grainy or distorted.

We also look for signs of chromatic aberrations. The manifestation of such aberrations

sense because doing so reveals a tiny optical viewfinder and lens. The only other external feature of note is the USB port, which also charges the lithium-polymer battery.

This camera's operation is ultra-simple. One button cycles through resolution and deletion control, while the other button toggles the button beep and self-timer. The beep, ubiquitous on digicams, is actually useful in this case, as it indicates when a button has been pressed or a picture has been taken. Without that shrieking tone, the only way to confirm a shot is to look at the number of shots remaining.

Although most cameras employ CCD sensors, many sub-\$150 models instead employ CMOS sensors, which are more power-efficient and (cough, cough) cheaper to produce. Still, this CMOS chip has 1.3-megapixel punch, capturing images at a maximum resolution of 1,280 x 960 (through interpolation). You can bump resolution down to VGA quality, too, but the 16MB of internal memory still weirdly stores only about 52 photos.

Because this camera has so few parts and features, reporting on performance is a bit of a moot point. Shot-to-shot times are nearly instantaneous, and minus a flash, there's no strobe delay. Without a way to illuminate scenes with little ambient light, Logitech added Autobrite image processing (from SMaL Technology) technology to the Pocket Digital. This technique lets the light sensor capture better images, even in scenes with odd lighting conditions, including indoor shots where light is at a premium.

I wasn't overly impressed with some of the images I captured with this technology. Most colors looked realistic outdoors, but indoors I found a number of underexposed shots. Chromatic aberrations were minimal, but I noticed that a shot of a brick building resulted in a retina-wrenching moiré pattern, a problem that's plagued cheap sensors in the past.

I also found the inaccurate viewfinder off-putting. In numerous shots, I targeted a flower in the middle of the viewfinder from a few feet away. Invariably, the blossom appeared far to the left or right of center in our final images, so it's easy to imagine portrait shots with the subject's face missing above the eyebrows. You'll have to back off a step or two and put in extra practice to snag well-composed shots with this one.

In the market of super-small digicams, the Pocket Digital is the slickest looking product to date. It's perfect for slipping into your pocket on days when carrying a larger camera isn't feasible, but don't expect printable shots.

SiPix StyleCam Blink

SiPix's StyleCam Blink is a third smaller than Logitech's little camera and costs less than a third of the Pocket Digital's suggested price. Oddly enough, the Blink takes better pictures.

The Blink is the ugly little sister to the beautiful Logitech. Although its squarish, clunky case lacks aesthetic appeal, the CMOS sensor (maximum resolution 640 x 480) redeems this camera, which is by far the least expensive I've reviewed. The Blink comes with 8MB of SDRAM and a fixed-focus lens with a range of about 23 inches to infinity. SiPix supplies the single AAA battery necessary for power.

Features are sparse, but there are just enough options here to help you take some decent shots. Two basic shooting modes, Indoor and Outdoor, are supposed to increase white balance accuracy. Indoor shots still showed significant yellowing under fluorescent lights. Outdoor shots, even in bright sunlight, had realistic coloring.

Most shots featured obvious noise, and there were instances where colors bled into each other, further marring the details. Distortion was noticeable, and image edges occasionally appeared to almost disintegrate. Still, there were some surprises. I took a few close-ups of foliage and did a double take when I saw the results. Colors were lush and green, and noise was barely visible at first glance.

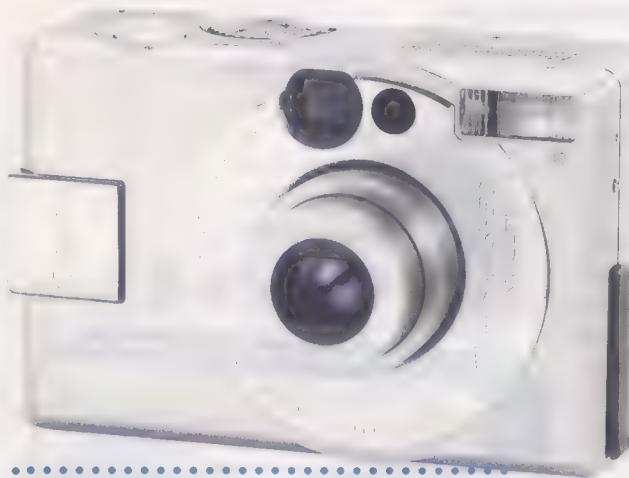
I had a couple of complaints about performance. First, the camera's tiny case makes it easy to block the lens with a wayward finger. Second, there's about a 0.5-second delay from the time you press the shutter button to the time the camera shoots, resulting in blurred shots if you don't hold steady. The viewfinder, however, is far more accurate than on the Logitech.

If you really want a tiny camera with an equally diminutive price tag, the Blink is my

StyleCam Blink

\$40
SiPix
(866) 888-1678
(408) 719-8888
www.sipixdigital.com





PowerShot S330 Digital ELPH

\$499
Canon
(800) 652-2666
(714) 438-3000
www.powershot.com



recommendation. If you want printable images, though, keep reading.

Pocket-Sized Digicams

If you need a camera that's capable of capturing great photos, you have to take a quick, steep climb up the price scale. What won't

increase much, however, is camera size. I found two excellent cameras that will go almost as many places as the super-small products, and in addition to taking excellent pictures, these pocket-sized cameras come loaded with features.

Canon PowerShot S330 Digital ELPH

Last year manufacturers exerted too

much effort trying to win the megapixel marathon. A few companies managed to push 3- and 4-megapixel cameras into a reasonable price range, but these cameras were starved for features, performed sluggishly, and really didn't take great photos.

In 2002, companies are focusing more on refining their 2- and 3-megapixel models. These beauties have improved features and snappy performance, and best of all, they capture stellar images. The PowerShot S330 is one of the standouts in this new generation of digicam.

The S330 is as eye-catching as cameras come. Its elegant, rugged metal case means that even if you drop it like I did (oops, sorry Canon), internal circuitry has a better chance of surviving impact. In the box, Canon provides a robust Li-Ion battery to help you avoid wasting your time and money with AAs.

The case hides a 2-megapixel CCD and 3X zoom lens (35mm to

105mm film-camera equivalent) that quickly extends at startup. I've seen Macro modes with better close-up capability, but the 6.3-inch to 2.5-feet range here is fine unless you're into shooting aphids.

The S330 has first-rate performance. Shot-to-shot times are quick, even with the flash engaged, and the 1.5-inch TFT monitor has a fast refresh rate. Picture quality isn't perfect, but it's quite good for a camera of this price. Colors are accurate in almost every situation. I noted excessive chromatic aberrations only in scenes with extreme light contrasts.

The S330's Auto mode properly exposes most scenes. If not, the exposure compensation setting is easy to adjust, and you can alter shutter speeds from 15 to 1/1,500 seconds. ISO sensitivity is adjustable, too, from 50 to 400 (film equivalent). There are numerous other settings to tweak your shots, including two metering modes, flash exposure lock, and six white balance settings. Additionally, you can calibrate your own white balance setting to counteract peculiar lighting.

To sweeten the deal, Canon also threw in a new Photo Effects menu. These effects let you take photos in black and white and sepia. You can also use the camera's Neutral mode to tone down colors, or take the opposite approach and intensify hues with the Vivid Color setting.

Should you tire of still shots, you can engage the Movie mode to record clips as long as 30 seconds. Whereas many cameras

A Comparison Of Creatively Crafted Cameras

	Logitech Pocket Digital	SiPix StyleCam Blink
Category	Super Small	Super Small
Price	\$130	\$40
Imaging Sensor	1.3-megapixel CMOS	VGA CMOS
Lens	Fixed focus	Fixed focus
Maximum Resolution	1280 x 960 (interpolation)	640 x 480
Memory Type	Internal	Internal
Memory Capacity	1.6MB	AAA
Optical Viewfinder	Yes	Yes
LCD Screen	Monochrome	Monochrome
Power Source	Li-Ion polymer	one AAA
CPU Rating	2.5	3.5
Final Word	Tasty on the outside but images are rather bland	Surprisingly cheap, surprisingly good
URL	www.logitech.com	www.sipixdigital.com

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

are still micless, the S330 lets you add sound to your videos, too. You can also shoot video clips at three resolutions, with 640 x 480 being the maximum. Even at that resolution, scenes are pretty grainy, and I would have preferred that clip length be limited only by memory card constraints.

Playback mode sets a new standard for all digicams. If you so choose, the S330 will immediately let you review the shot you just took. That's not new, but Canon also spruced things up by adding pertinent exposure data, including a histogram to help you quickly spot exposure problems.

The downsides? For starters, the wussy 8MB CompactFlash card is just the most recent example of the ridiculous cost-cutting measures companies make to compete. It's sort of like equipping a Corvette with a one-gallon gas tank—you're not going anywhere on this one. Plus, in close-up shots, it was occasionally hard to obtain focus lock, though in most cases, patience helped me take crisp shots. And though this camera has a tough exterior, a case would've been nice, although such an addition would probably make the camera a tad less pocket-friendly. I also thought the rubber port cover looked lame in contrast to the snazzy metal case. This cover is sure to wear out and break off after the camera is repeatedly pulled from your pocket.

With only minor flaws, the S330 is an excellent camera well worth its \$499 price tag. Of course, it's in some tough competition, especially

from the likes of companies such as Minolta.

Minolta DiMAGE X

Minolta's DiMAGE X has optical zoom power, but just by looking at the case, you'd never know it. Using an ingenious lens design, Minolta packed 3X optical zoom (35mm to 111mm film-camera equivalent) capability into the X's case, which has no extending lens barrel. In fact, the camera's case doesn't look like a camera at all; the X bears more resemblance to a really pretty piece of scrap metal.

One word can sum up the ancient Chinese secret behind the invisible zoom lens: periscope. Basically, a system of mirrors reflects images into the camera, where the zoom lens moves vertically through the length of the case. The best part is the system works well. The X starts up fast and zooms fairly quickly to every subject, with a close-up range of about 9.8 inches; that isn't as close as macro enthusiasts will like, but it'll suffice for everyone else.

Minolta meticulously honed the other components of this camera, too. The 1.5-inch TFT monitor shows none of the lag I still see with cameras that cost significantly more. Every control and menu option works quickly and intuitively. The 2-megapixel CCD captures



DiMAGE X

\$399

Minolta

(877) 462-4464

(201) 825-4000

www.minoltausa.com



We put six cameras with cool designs and functions to the test. Here's how they compare.

Canon PowerShot S330 Digital ELPH	Minolta DiMAGE X	Casio L. BROS. GV-10	Sealife Reelmaster DC100
Pocket Sized	Pocket Sized	Adventure	Adventure
\$499	\$399	\$350	\$450
2-megapixel CCD	2-megapixel CCD	1.2-megapixel CCD	1.3-megapixel CCD
3X optical zoom	3X optical zoom	Fixed focus, 2X digital zoom	Fixed focus, 2X digital zoom
1,600 x 1,200	1,600 x 1,200	1,600 x 1,200 (interpolated)	1,280 x 960
CompactFlash	Secure Digital	CompactFlash	Internal: CompactFlash slot
8MB	8MB	8MB	8MB
Yes	Yes	Yes	Yes
1.5-inch TFT	1.5-inch TFT	1.6-inch TFT	1.6-inch color LCD
Li-Ion	Li-Ion	Four AA	Four AA
4	4	2.5	2.5
Chock-full of features and takes good pictures to boot	Smart design and snappy performance	Tough outside protects wimpy innards	Fills niche for affordable underwater digicams
www.powershot.com	www.minoltausa.com	www.casio.com	www.sealife-cameras.com

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect



G. BROS. GV-10

\$350
Casio
(800) 435-7732
(973) 361-5400
www.casio.com



Like the S330, the X relies on a rechargeable Li-Ion battery. The cell is on the weak side, so you'll still want to keep a spare on hand for times when you can't afford to wait through a lengthy recharge session.

Suspect picture quality aside, the X's remarkable zoom system makes it worth checking out, especially if you're concerned about space constraints. If you're worried about durability, though, check out our next two reviews.

Adventure Dicams

Simple dust and water cause havoc with many dicams, and adventurous types who need tougher cameras have relatively few choices. I tried two models that are out to challenge Mother Nature in her own backyard.

Casio G. BROS. GV-10

Casio integrated some surprisingly nice touches into its G. BROS. GV-10. Most of

images that are fine for making 5- x 7-inch prints, although, as you'll see, 8 x 10 is probably a bit too much to hope for.

Image quality for this camera is quite good, but it's far from perfect. Lower-resolution shots had more than their fair share of yellowing under fluorescent lighting, and there were numerous chromatic aberrations. The worst problem, however, was plain old noise, which was more evident here than with the S330, as dark areas were especially plagued with graininess. Barrel distortion was apparent but not to the point of distraction.

That said, a bunch of manual controls probably wouldn't have improved this camera's photos, but I would've liked at least a little more functionality. As it stands, the X gives you power over only exposure compensation, four white balance settings, and flash mode.

A product can always redeem itself, of course, and the X does. Minolta included a microphone that lets you record audio only;

you can also use the sound to complement the X's 35-second full-motion (15fps) video. Movie clip resolution tops out at 320 x 240, so don't expect to film "Episode III" with this one.

Like the S330, the

X relies on a rechargeable

these details are designed to add durability and protection from outdoor elements.

The camera's case is modeled from hard fiberglass, which is surrounded by a shock-absorbing, rubbery elastomer. Both elements add a lot of heft to the camera. It weighs in at more than 0.5 pound, without the wimpy 8MB CompactFlash card and the four AA batteries needed for power.

Common sense tells you a heavier camera falls harder. That's OK in this case, though, because Casio thought far enough ahead to cushion the camera's innards, too, using gel packs to soften blows to circuitry. The GV-10 is water-resistant, as well. Each locking compartment has a rubber gasket that keeps things dry in 3 feet of water for about 30 minutes.

Sadly, the prison-like strength of the GV-10's outer shell has the effect of an overprotective mother—the camera's insides never really got a chance to grow. Casio included a lightweight 1.2-megapixel CCD and chintzy fixed-focus lens (2X digital zoom) that lets you get as close as 4 inches to your subject. The spec sheet notes that the camera's resolution maxes out at 1,600 x 1,200, which obviously doesn't add up if you do the math. The extra pixels are due to interpolation, which will only hamper image quality in most cases.

Our tests showed the GV-10 takes below-average photos at any setting. Most images had lots of noise, and as a result, details got the wash. I wouldn't expect to capture many printable photos from this one.

That's only if you manage to get any shots off in the first place. Sure, this camera is sturdy enough to take along for a day of rock climbing, but the fact is that the frustrating control interface will be next to impossible to use while you're dangling from Devil's Tower. Want to change resolution? Casio inexplicably forces you to rotate the mode dial to Play and then use the plus, minus, and shutter buttons just to change this one setting.

One of the GV-10's pros is its huge number of preset scene modes. There are 18 in all, and they'll automate the picture-taking process a bit so you don't need to fuss with too many settings.

If you're a real-life action hero who's continually breaking your high-tech toys, a camera such as the GV-10 is a godsend. But if you can learn to be a little nicer to a regular camera of

the same price, you'll get much better pictures in return.

SeaLife Cameras Reefmaster DC100

Although the GV-10 is meant for only short periods of submergence in shallow water, the Reefmaster DC100 is a true underwater digicamera. The camera itself isn't waterproof; its underwater capabilities work courtesy of a watertight housing that clamps around the camera to keep it dry.

The DC100 has a 1.3-megapixel CCD that's paired with 2X digital zoom. The fixed-focus lens works from 2 feet to infinity in normal shooting mode. Macro shots look clearest from about 1 to 2 feet.

SeaLife provides Land and Sea shooting modes on the DC100. The Sea mode helps the camera automatically determine proper exposure settings using center-weighted metering. This is necessary because while submerged you can access only two controls through the housing. One toggles the power switch, and the other activates the shutter button.

You can store about 138 images in the internal 8MB flash memory or only about 17 images at highest resolution and low compression. This, of course, presents an interesting problem—how do you clear space in memory if you're 100 feet beneath the surface? SeaLife keeps things simple. After every shot, the DC100 displays the new image. If you like it, do nothing and it's stored. If you miss your subject (easy to do when floating around), just press the shutter button to delete the image and shoot again.

Lacking an ocean nearby, I tested the DC100 in a local swimming pool on a sunny day. As the manual indicated, subjects beyond 6 feet blurred quickly into blue oblivion. Within range, our subject's details were clear and colorful. As is commonly the case with CCDs under 2 megapixels, though, a few of my underwater test images were quite noisy (as well as a bit wavy, but that was to be expected).

I also put on my land legs and tested the DC100 in the camera's Land mode. These images revealed more apparent noise, as well as some coloring inaccuracies. Lens distortion wasn't an issue, but the flash was inconsistent. Sometimes it burned up-close subjects, while in other shots it paired well with the

automatic white balance to create images with good coloring.

Manual controls are quite limited. There are five white balance settings, and you can control exposure compensation, but that's it. Battery life is another concern. Not only does SeaLife omit the four AA cells you'll need (these are listed as "optional" in the manual), but after you supply your own, you also will see them sucked dry after only an hour or so of continuous shooting time.



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Affordable underwater digital cameras are a rarity, so if you want decent shots of your favorite underwater hideout, I don't hesitate to suggest the DC100. If you want a camera that does adequate double-duty on land, however, you'll have to spend more.

Final Word

As you can see from this small sample, digital cameras come in all shapes and sizes and work in a variety of situations. Picking the right camera for you means prioritizing according to your needs. Of the six cameras here, only the Minolta and Canon will really take pictures worth printing. The others, however, are well suited for creating a good digital image gallery to email to your friends. ▲

Reefmaster DC100

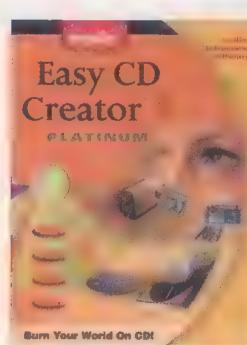
- \$450
- SeaLife Cameras
- (800) 257-7742
- www.sealife-cameras.com



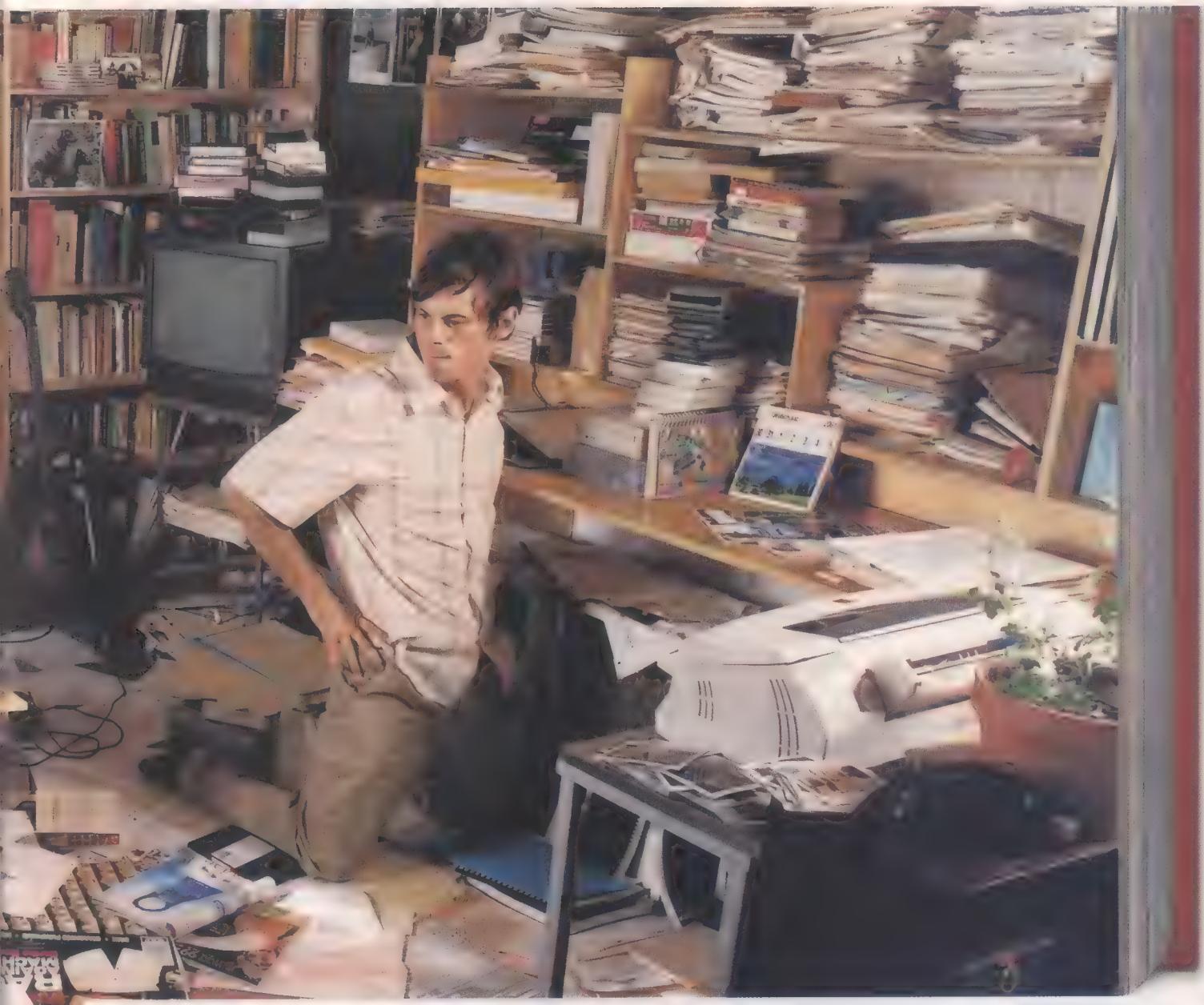
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by Nathan Chandler

room to burn



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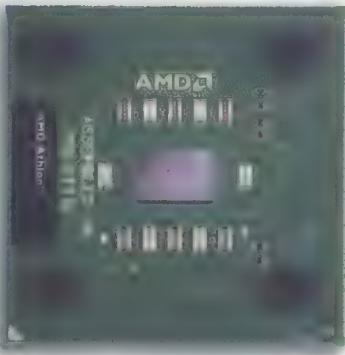


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AMD Athlon XP processor on the "Palomino" core

Processor Size: 180nm
Die Size: 128mm²



AMD Athlon XP processor on the "Thoroughbred" core

Processor Size: 130nm
Die Size: 80mm²

Until last month, AMD had enjoyed a long honeymoon with the Athlon XP where performance was concerned. But Intel continued cranking up the P4's frequency to 2.53GHz. And then the performance crown was passed to the boys in blue (Intel) in large part due to a faster 533MHz FSB. With the ball in AMD's court this month, the boys in green (AMD) have released some counter measures of sorts via the Thoroughbred core. I say counter measures as opposed to return fire because AMD's focus seems to be firmly set on its longer-term future with its eighth-generation Hammer architecture, and the company may have already conceded the race for the fastest CPU in the west.

But just because the Thoroughbred offers no performance enhancements (L2 cache is still 384KB) over the current Palomino core, which it is replacing, don't get all huffy like Count Dooku. AMD's decision to transition to the Thoroughbred is a good one on paper. The core itself is thinner and less expensive to manufacture; harbors fewer transistors (down from 37.5 to 37.2 million) and runs cooler due to better heat dissipation, thus allowing for higher clock speeds; and operates at lower voltages. That's the general idea why AMD, playing catch-up, has made the shift from the 0.18-micron Palomino core to the 0.13-micron Thoroughbred core.

The Athlon XP still continues to win out in the "bang for your buck" arena, and AMD is clearly playing to its strengths with this newer core. The Palomino core was already small at 128mm², but Thoroughbred slices that down to a paltry 80mm². The smaller the chips, the more AMD can manufacture per wafer. Compare this

to Intel's gargantuan P4 Northwood core at 145mm², 55 million transistors, and 512KB cache, and you can start to see why Intel's top-performing processor ends up being so much more expensive. Intel is still playing catch-up in the price department and trying to move to the cheaper 0.09-micron process for Prescott. At present, the P4 is rumored to be

getting some hefty price cuts in the interim, thanks to manufacturing with larger silicon wafers. Intel might not look at Thoroughbred as "the sum of all fears" due to lack of increased L2 cache or an upped FSB, but AMD is still sitting pretty and can drive prices down even more aggressively, even if it can't win in the MHz department just now.

So with nothing much new (AMD did reposition the power regulating capacitors to the top) and exciting in the technological arena to report, the new Athlon XP already has a greater IPC than the P4, and even though it is clocked lower than Intel's P4 (currently at 2.53GHz), it is still a screamin' demon, where performance is concerned. If you already own a Palomino-based 2100+, put the safety on your weapon, soldier. Save that cash for another day. But if you own an older Athlon and want to upgrade to Thoroughbred, you're on the right track. Motherboard compatibility is groovy, thanks to the continuation of the socket A route, and other than a BIOS update, the new CPU should work fine in your current socket A-based mainboard. OEMs will breathe a sigh of relief, as no hardware changes are necessary to accommodate the latest Athlon XP. At an initial \$241 release, you can't go wrong, unless you wait a few weeks for the price to inevitably drop and then find yourself pulling the arms and legs out of your favorite childhood teddy—in frustration.

Overclocking is a bit of a nonstarter (less than 100MHz), which will disappoint and perhaps cause a bit of concern regarding future steppings of the Athlon XP cracking 2GHz anytime soon. With the 266MHz FSB being a major bottleneck in terms of performance, and even with the extra 66MHz, Intel's P4 still fares slightly better in the benchmarks. (See the scores on the left.)

The introduction of the Thoroughbred is a bit underwhelming by AMD's recent standards, and although fast, Intel is still faster but more expensive. But look for AMD's 0.13-micron process to mature and, given some time, eke out greater frequencies. Perhaps a more exciting core, such as "Barton," will be able to win back the performance crown. ▲

Thoroughbred Faces Northwood

Athlon XP 2200+ vs. P4 2.53GHz

CPU	Score	Score
AMD Athlon XP 2200+	1000	1145
Intel Pentium 4 2.53GHz	1403	5892
Siemens ES 575MHz/180nm	133	348
OptiX Pro 4000 55MHz/180nm	180	376
Crusoe 32MHz/180nm	103	309
Intel Pentium 3 1.3GHz/180nm	709	115
Compaq 400MHz/180nm	44	51
Siemens Sem TSE A65 2.0GHz	151	161

* Tested on a Win2K Pro system

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

by Alex "Sharky" Ross

Intel 845G Chipset

P4 owners have some choices when it comes to platform setups. You can go RDRAM, or you can be more popular and go with the slightly cheaper DDR. In that case, you have many choices, with SiS, VIA, and Intel offering competitive solutions.

Intel's latest offerings in the form of the i845G/GL/E have just been released to go hand-in-hand with newer 533MHz FSB P4s. Memory support comes in the form of DDR266/200 for the 845E and 845GL, but for those wanting to push the performance envelope, the 845G offers the best overall solution. Although Intel has yet to officially embrace DDR333, OEMs offer the necessary multiplier to run the memory bus asynchronously at 166MHz, letting you slot in faster DDR333 memory.

Along with a new chipset, Intel has thrown its hat back into the integrated graphics ring with a new core for the corporate and value sectors, where you can run P4s coupled with an 845G without an add-in card, thanks to integration. DO NOT expect NVIDIA/ATI-like 3D gaming performance from integrated graphics. But you can do your spreadsheets and work and play games at lower resolutions at lower frame rates. And your IT manager can cost-cut the price of a better performing graphics card at the same time.

The 845G features Intel's new 82845GMCH (north bridge) with said integrated graphics controller. An AGP port is also available for folks like us with high-end 3D gaming tendencies. The GMCH also features an improved memory controller with "unofficial" support for DDR-SDRAM running up to 333MHz.

The 845G graphics core is completely new. A decent 350MHz integrated 24-bit RAMDAC with support for dual-display (via an add-in VGA card) will suffice in the office where 2D is concerned.

Clocked at 200MHz, Intel calls the G "Intel Extreme Graphics," which is obviously a bit of an overstatement. Nevertheless, basic 2D and 3D video functionality is available, as is D3D support. (Intel claims DX8 compliance but . . .) Intel uses Dynamic Video Memory Technology distributing memory (up to 64MB) between the system and the graphics controller itself. With support for multitexturing, basic bump mapping, and AGP 4X, there

are few features you can actually turn on in games. The graphics chip is not a fully DX8 compliant part, however. Programmable Pixel and Vertex shaders are absent, as is a T&L engine. And you'd best not mind aliasing because there's no hardware AA, either.

Intel is introducing its Intelligent Memory Manager Technology for addressing memory for the GMCH efficiently. Intel's Zone Rendering Technology optimizes the rendering process for the GMCH's internal caches/buffers, also improving memory bandwidth for the shared 64MB DRAM. Either way, performance is somewhere in the same league as NVIDIA's older GeForce2 MX.

Integrated graphics solutions from graphics specialists such as NVIDIA (nForce only supports AMD CPUs) and ATI IGP are far better performers in terms of onboard graphics.

The i845 also debuts Intel's new ICH4 south bridge with an integrated USB 2.0 controller, able to support six USB 2.0/1.1 ports. USB's peak transfer rate is boosted from 12Mbps to 480Mbps. OEMs might not be thrilled to know that the die size is increased over the older ICH2, making it more expensive.

Putting the integrated graphics aside and looking at the 845G chipset as a possible high-end gaming solution yielded some surprising results: The P4 with DDR memory is really good. The benchmarks run were "system level" for the sole purpose of *CPU* readers, who will use that AGP slot 99.9% of the time. The i845G could end up being a popular offering based on this kind of performance. (See the scores on the left.) Look for motherboards from Intel, Asus, Gigabyte, MSI, and the rest by the time you read this. 

by Alex "Sharky" Ross

Intel 845G Benchmarks

Tested on a WinXP Pro P4 2.4GHz

	WAN-GBR333	ASUS PC1964	Yamaha STU-DR333	SIS 645 DDR333
3DMark 2001 DirectX	11857	11425	11254	10894
Internet C/C++Mark 2002	222	143	130	131
Office Productivity 3DMark 2002	169	131	116	137
Quake 3 440x400	291	309	306	324
winzip 3.0.04 x768	110	115	112	108
Commerce 4 Default	87	51	37	48

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

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Unless your PC has a recent motherboard with the right connections, you may be wondering when—not if—you'll get around to adding FireWire and/or USB 2.0. This

Belkin kit will help with the latter. It gives you as many as five USB 2.0 ports at a moderate price.

Belkin's Hi-Speed USB 2.0 Computer Upgrade Kit (part number F5U900) will save you money over buying its components separately, although the company's products are rarely the least expensive in any area. The kit includes a Belkin four-port hub (F5U224), a two-port PCI card (F5U219), and a USB 2.0 cable for connecting the two. The kit also comes with drivers as needed to work with Win98SE/Me/2000/XP. Because USB depends more on your CPU than does FireWire, it makes sense to get a fast processor

and corresponding memory before installing "Hi-Speed" USB 2.0.

Everything went well for us as we installed the Kit in a PC with a 1GHz PIII, 384MB of SDRAM, and WinXP Pro. We connected a SmartDisk FireFly 5GB USB 2.0 hard drive to the hub and read and wrote files with speed and ease. Both the adapter and the hub seemed like quality items. The hub has LEDs to indicate ports in use.

It's smart to continue using your system's existing USB 1.1 ports for slow USB peripherals, such as mice and keyboards, leaving your new USB 2.0 jacks free for faster devices, such as external hard drives and digital music players. We've also noticed slowdowns when USB 1.1 and 2.0 devices are mixed, even on a USB 2.0 chain. Finally, be sure to use USB 2.0 devices with USB 2.0 cables, as USB 1.1 cables will slow them down. ▲

by Marty Sems

Leadtek WinFast A250 TD



WinFast A250 TD

\$275

Leadtek

(510) 490-8076

www.leadtek.com



Leadtek seems to have a knack for taking a good video chip and turning it into an even better video card. That seems to be the case with its WinFast A250 TD, a video card that costs considerably less than an NVIDIA Ti 4600 but performs nearly as well.

The A250 TD uses NVIDIA's Ti 4400 GPU, which is a notch below the Ti 4600 in terms of power. The main difference between Leadtek's WinFast A250 TD and the top-of-the-line A250 Ultra TD is clock speed. The Ultra TD (based on a Ti 4600 GPU) has a core speed of 300MHz and memory speed of 650MHz. The A250 TD has core and memory speeds of 275MHz. The A250 TD has 128MB of DDR-SDRAM and a maximum 2,048 x 1,536 resolution. The card's refresh rates are from 60Hz to 240Hz, and it supports Win98/NT4.0/Me/2000/XP.

The A250 TD is only slightly less powerful than (and in some cases equal to) the Ti 4600 cards I've reviewed lately. The card's Overall 3DMark 2001 score was an excellent 9,336. The card's Quake III frame rates also impressed me. At 1,024 x 768, the card's frame rate was a rip-roaring 203.6fps. At 1,600 x 1,200, the frame rate was 148.7fps. Both scores are comparable to a Ti 4600 video card.

The A250 TD also posted excellent frame rates in two Serious Sam time demos at 1,600 x 1,200, charting 81.4fps in the Karnak demo and 91.9fps in the Metropolis demo. Those frame rates are nearly equal to those of a few Ti 4600 cards I've seen lately.

Many power users will pick up a Ti 4600 video card without thinking twice about the alternatives. However, the A250 TD costs about \$50 less than most Ti 4600 cards, yet is nearly as fast. In other words, it's a good buy. ▲

by Michael Sweet

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

Palm m130

From its physical design to its color screen, the Palm m130 was made to look good. This is Palm's latest effort to give buyers on a budget a high-tech organizer that looks as snazzy as the power-packing m500 series. At 4.8 inches high x 3.1 inches wide x 0.9 inches deep and 5.4 ounces, the m130 is the same size and weight as its grayscale predecessor, the Palm m125, but its new features and color screen really set it apart.

Palm seems to know it has a good thing going with the exterior design, so it's focusing on enhancing the guts. One of the most notable improvements is the m130's new Palm OS 4.1 operating system, which has enhanced alarm management and security features. Palm OS 5.0 came out recently, but it is too soon to tell whether the improvements in version 5.0 will warrant waiting for a newer Palm.

The display brings color to the budget user and is bright and readable whether you're indoors or outside. The STN (Super Twist

Nematic) technology bends light rays to improve the quality of the display. Because it's passive, it's cheaper than PDAs with TFT displays.

The Palm m130 has the same 33MHz Dragonball VZ processor you'll find in the m500 series. Like the m125, the m130 has an SD and MultiMediaCard expansion slot. This lets you add storage space to the internal 8MB of RAM via a separate expansion card. Other expansion cards hold a variety of software. The rechargeable lithium-ion battery should last a week, but actual battery life will depend on the user.

Palm rounds out the m130 with a strong software package: DataViz Documents To Go 4.0, MGI PhotoSuite Mobile Edition 2.23, Palm Reader 1.0, and HotSync Mail for Windows. At \$279, the Palm m130 commands the highest price tag of the m100 series but is inexpensive for a PDA with a quality color display. ▲

by Joshua Gulick



m130

\$279
Palm
(800) 881-7256
(847) 262-7256
www.palm.com



• • • •

Canon CanoScan N676U

At \$99, the CanoScan N676U from Canon definitely brings truth to the saying: "You get what you pay for." Compared to similarly priced models, this scanner was far from taking the cake. Don't get me wrong; there are things to like, including a great software bundle. Unfortunately, the great features of the ArcSoft PhotoBase and ArcSoft Photo Suite apps weren't enough to change my mind.

The CanoScan N676U is light and small, standing just 1.4 inches high and weighing a mere 3.3 pounds. A bundled stand lets you set the scanner on its side to give you even more room. You can use the stand to store the scanner, but it was almost impossible to run scans this way, as the paper kept falling out. A taller stand that could hold the lid shut would help. Also, the soft pad on the lid's inside wasn't secured well and could easily be pulled off. Canon included its usual Z-lid to make scanning 3D objects much simpler than with the adjustable lids common to other flatbeds.

At the maximum resolution of 600 x 1,200 dpi, scans averaged a little less than a minute per scan. I scanned six photos ranging from black and white to color. Scans rendered great color and brightness, but some of the lines were indistinct and muddled. There were also portions of images that were extremely dark and had details I couldn't see. While previewing and scanning the images, the scanner produced a high-pitched squeal that was a bit unpleasant to listen to.

Canon does make some great scanners. In the case of the N676U, however, it might be worth dishing out that extra \$30 to \$50 for the next model up. For beginners, the software is great, and the scanner's ease of use is incredible. However, as with most low-end scanners, there is definitely room for improvement. ▲



CanoScan N676U

\$99
Canon
(800) 652-2666
(516) 328-6700
www.usa.canon.com



• • • •

by Mary Lafferty

Memorex Universal Card Reader



Universal Card Reader

\$59.99
Memorex
(562) 906-2800
www.memorex.com



“**Y**eah, my computer can do that.” Think about it: A system that can do almost anything you ask is just as gratifying as triple-digit frame rates in your favorite game. When your buddy comes over with his new digital camera or MP3 player, the last thing you want to admit is that your rig can’t accommodate its oddball flash memory card format. \$59.99 will make you the MacGyver of computing once again.

Memorex (you know, your favorite CD-R vendor) is spitting out gadgets these days, and I happened to get hit with its Universal Card Reader. It looks good, doesn’t take up much space, and plugs into any USB port. The real reason you should care is that with just two slots, the Reader supports SmartMedia, CompactFlash Type I and II, Memory Stick, MMC (MultiMediaCard), and SD (Secure Digital) cards. The CompactFlash card slot is

a little tight, and the Reader tended to slide around my desktop too easily, but those are minor complaints.

This reader runs under Win98SE/Me/2000/XP right out of the box, Win98 with an included driver, and Mac OS 9.x or later. My WinXP Home test PC recognized the Reader, as did the same system running WinMe after I helped it find a CAB file on the hard drive.

Memorex claims a 900KBps maximum read rate for the Reader, but this obviously depends on the type of card you’re using. It wrote an 8MB CF card for me at roughly half a MB per second. I also tried a 16MB Memory Stick for function’s sake. Here’s where the Reader’s instruction leaflet dropped the ball; Memorex doesn’t mention anywhere that you need to insert Memory Sticks upside down. Regardless, I like this thing. ▲

by Marty Sems

TDK veloCD 24X/10X/40X CD-RW USB 2.0



veloCD 24X/10X/40X CD-RW USB 2.0

\$214.99
TDK
(800) 835-8273
(516) 535-2600
www.tdk.com



This USB 2.0 burner from TDK has a bit of an inferiority complex. It really should not, even compared with its sleek IEEE 1394 veloCD sister. This drive is the more practical of the two. Even though it’s not as fast as the FireWire version—both are 24X/10X/40X drives, by the way—it’s a better value.

TDK’s press rep actually pitched the idea of a head-to-head comparison between the two drives as a sort of showdown between USB 2.0 and FireWire. Hey, I’m always up for a standards slugfest when variables, such as manufacturer and rated drive speeds, are eliminated. However, the suggestion still took me by surprise because vendors would generally prefer to chew off one of their own feet than risk making one of their products look bad.

TDK knew it didn’t have to worry. This USB 2.0 drive read, wrote, and accessed data a little more slowly than the FireWire version, but it only costs \$214.99 compared to

\$315.99 for the IEEE 1394 model. On our 1GHz PIII test system with WinXP Pro and an Adaptec USB 2.0 adapter, this veloCD burned a 700MB CD-R in 4:45 (3:31/427MB) and a 639MB CD-RW in 8:48 (6:34/427MB). That partial CD-RW time was 23 seconds faster than the FireWire veloCD’s, but that was the USB 2.0 version’s only victory. It read a maximum of 5,790KBps (4,327KBps average) and had 109ms and 257ms random and full-stroke access times.

This drive’s main advantage over the FireWire TDK is that you can use it in any USB 1.1 port, albeit at 4X burning maximum. Either will work under WinXP, but first you’ll need to download at least 24MB of updates from TDK. ▲

by Marty Sems

CPU Ranking:  0 = Absolutely Worthless   2.5 = Absolutely Average    5 = Absolutely Perfect

Leica DIGILUX 1

Some of my coworkers laughed at the Leica DIGILUX 1, asking me if it was a 35mm camera salvaged from a garage sale. But their snickering soon turned to pleading as they begged me to let them use the DIGILUX 1.

Why the change of heart? The 4-megapixel DIGILUX 1 has a huge 2.5-inch LCD, 3X optical zoom, a hot shoe, Exposure Compensation, Flash Compensation, Aperture Priority, Shutter Priority, and Video mode. You can record five seconds of audio while shooting each image, or you can record 10 seconds of audio per shot in Playback mode. A detachable LCD hood shields the screen from light, making it possible to use the LCD outdoors, even on very sunny days. The camera also bundles a whopping 64MB of SD memory, a rechargeable Li-Ion battery, a built-in charger, and USB and video cables.

The DIGILUX 1's large size makes it a little awkward, but its menus, buttons, and dials are fairly straightforward. What makes this camera

user-friendly, though, is its quick write time. Other 4-megapixel cameras often have write times of as long as 30 seconds. I waited only seconds between shots with the DIGILUX 1.

Image quality was fairly impressive. A macro shot of a keyboard displayed details such as tiny hairs and dust. Some indoor shots were dark, but adjusting the Flash Compensation corrected this. Adjusting any WB settings, however, created a lot of noise in the image. I tested a preproduction model, but WB may be an issue because a Leica rep told me the final product will incorporate the same internal software.

The DIGILUX 1 is a unique 4-megapixel package for less than \$900. It's not as pretty as comparable Olympus or Nikon cameras, but you won't find another camera with a 2.5-inch LCD, LCD hood, and 64MB of bundled memory. ▲

by Kylee Dickey



DIGILUX 1

\$895
Leica
(800) 222-0118
(201) 767-7500
www.leica-camera.com



Fujifilm FinePix F601 Zoom

The 3-megapixel Fujifilm FinePix F601 Zoom is the successor to the popular FinePix 6800 Zoom. The F601 sports newly designed, colorful menus, as well as images interpolated to 6 megapixels.

Although visually appealing, the menus take too long to navigate. For example, it would be nice to toggle between Macro On and Macro Off from the main menu instead of having to enter a Macro submenu. You must use the menus to adjust other settings, too, such as Aperture and Shutter Priority.

The mode dial was within easy reach of my index finger at all times, but I had to watch that I didn't place my fingers over the flash sensor or the microphone on the front of the camera.

The 6800's video-out option is gone, as is the LCD status screen with its battery-level and shots-remaining indicators. Also note that the 6800's standard docking cradle is now a \$59 optional accessory. Because the USB port is on the bottom of the F601, you may need the cradle to use the Web cam features.

Photos had excellent lighting but looked soft overall until I changed the default Sharpness setting. An AF illuminator might also have helped, but alas, the F601 doesn't have one. This camera's greatest weakness is barrel distortion; bowing was severe at the edges of photos and still present in the center third of images. And the 3-megapixel shots looked just as good as the much-hyped 6-megapixel-interpolated images.

The F601 wasn't designed for the experienced photographer who needs quick access to manual controls. If this camera isn't right for you, you might consider it as a gift for the novice digital photographer who will find the Fujifilm FinePix F601 Zoom's menus fun and easy to use. ▲

by Kylee Dickey



FinePix F601 Zoom

\$599
Fujifilm
(800) 800-3854
www.fujifilm.com



Memorex RF5700



RF5700

\$59.99
Memorex
(562) 906-2800
www.memorex.com



With its new RF5700 wireless keyboard and mouse combo, Memorex seems to be vying for Logitech's position as the supreme maker of lightweight, feature-packed, standard and wireless keyboards. In fact, the RF5700's

dark-silver case design and black keys closely resemble Logitech's awesome Cordless Freedom Optical. There are differences between the keyboards, though, one of which is that the RF5700 sells for \$40 less than its Logitech counterpart.

What are the other differences? The RF5700 mouse is a standard ball type (Logitech's is optical), but it has a groovy, high-centered design and two additional buttons (one on each side) for PC gamers. And unlike its Logitech counterpart, the RF5700 lacks an extra scroll wheel on the left side of the keyboard.

Memorex advertises the RF5700 combo as having a 6-foot range; I found this was true, as I

successfully used the keyboard and mouse sitting about 6 feet away from the receiver. The RF in RF5700 stands for Radio Frequency. Unlike infrared devices, you can type using the RF5700 regardless of what obstacles might exist between the keyboard and mouse and the receiver.

I thoroughly enjoyed using the keyboard. It has a standard 104-key layout and works with any Windows OS, including Win95 and later. The keyboard comes with a wrist rest that attaches and detaches easier than most—appropriate for a wireless 'board. There are seven multimedia hotkeys, six browser- and email-related hotkeys, and three power management hotkeys.

If you don't like the default hotkey functions, the bundled software CD lets you program them as you wish. The CD also includes software that tells you when the keyboard and mouse batteries are going dead. In all, the RF5700 provides high performance for a bargain-basement price. ▲

by Cal Clinchard

Memorex RF ScrollPro Optical Mouse



RF ScrollPro Optical Mouse

\$49.99
Memorex
(800) 636-8368
(562) 906-2800
www.memorex.com



I've been seeing more Memorex mice scurrying around these days, but the Memorex RF ScrollPro Optical Mouse really caught my attention. This mouse does less scurrying and more staying at home. When you're done mousing, return it to its Mouseport station where the two bundled AAA Li-Ion batteries can recharge.

The five-button cordless PS/2 mouse's package also includes a USB adapter, a receiver, and a plastic carrying case with shoulder strap. The case is a nice idea, but I wouldn't trust a \$50 mouse in a case with a flimsy plastic latch.

You can select from 57 functions for the two thumb-operated buttons and the scroll button, but these perform the same function at any given time and aren't individually programmable. You can't program the left or right buttons, but you can toggle their click and right-click functions by choosing a right- or left-handed configuration.

The RF ScrollPro Optical Mouse's contoured design, although initially comfortable, caused

my index finger to rest closer to the center scroll button than the left button. Thus, I had to strain some to click. The mouse operated accurately and smoothly on nearly all surfaces, including a fairly reflective mousepad. However, when I used it on even slightly slick paper, the mouse had erratic and uncontrollable pointer motion. Other reflective surfaces were problematic, as well, but as long as I used the mouse on a desktop, plain sheet of paper, or mousepad, its motion was very smooth. Although some cordless mice adjust power usage in varying degrees, this mouse shuts down completely if you don't use it for a couple minutes. Click any button to resume mouse operation.

The mouse's software supports Win9x/NT4.0/Me/2000/XP. If you want the security of having batteries that are always charged, take a look at the Memorex RF ScrollPro Optical Mouse. ▲

by Kylee Dickey

Falcon Northwest Mach V

Can't see the bar? That's because Falcon Northwest just jacked it up into the clouds. OK, all right, that's overstating things a bit. The visual periphery of which mere mortals are capable is lapping at the heels of Falcon's latest offering, and surely other high-performance PC-makers will deliver matching quality goods before you're done reading this review. But if you want to know what the current best is (in the Pentium 4 realm, at least), take a good look at this Five-CPU machine.

Specifications. If you look at Falcon's Web site, this Mach V configuration is essentially the "Budget Example #4: \$\$\$," except that configuration uses a 2.4GHz Pentium 4. This configuration uses Intel's 82850 chipset on an ASUS P4T-533 motherboard. The centerpiece is the fastest Intel CPU on the market: The 2.53GHz Pentium 4, with a 533MHz bus and 512KB L2 cache. For memory, the system has 512MB of PC1066 RDRAM. (Yep, that's the pricey and oh-so-worth-it Rambus RAM, friend.)

For storage, those Falcon maniacs packed in three IBM Deskstar 120GXP 82.3GB hard drives in a RAID configuration in 3+0 stripe mode. These are class-act Ultra ATA/100 drives that spin at 7,200rpm. Falcon also threw in a Plextor PlexWriter 40X12X40X CD-RW drive, a Toshiba 16X DVD-ROM drive, and the obligatory 3.5-inch floppy drive.

An NVIDIA GeForce Ti4600 (an AGP 4X video card with 128MB of DDR-SDRAM); a Creative Labs Audigy sound card; and a seven-piece, 500-watt, 5.1-channel Klipsch speaker set provide colossal multimedia effects. I viewed it all with a 21-inch Sony Multiscan G-520 monitor, sold separately for \$899 MSRP.

The system comes with a respectable number of ports: two serial, one parallel, one FireWire (IEEE 1394), and six USB. The system also has an Intel PRO/100 Ethernet adapter and modem. For input, the system has a Microsoft Internet keyboard and optical wheel mouse.

Falcon loaded the system with WinXP Home Edition and CyberLink's PowerDVD XP and Power Director ME, plus Roxio's Easy CD Creator. For this and other custom-built PCs, Falcon provides a 1-year warranty on parts and labor, which includes overnight shipping. For a price, you can upgrade to a 3-year warranty.

Design. (Read in a well-rehearsed-sounding voice:) "I was in no way influenced by the gorgeous ATC tower case painted in Exotix orange with the immaculately conceived CPU Computer Power User logo emblazoned with intensely artistic professionalism on the case's left side." Actually, the paint job is pretty darn cool, but it's not like I get to keep it or anything. Falcon claims it can concoct any color you can imagine for its cases; the paint jobs are baked on in a thermal downdraft oven for a real automotive finish.

The case opens easily: Remove two thumbscrews in back and slide the side panel backward and off. Inside is a beautiful combination of spaciousness and economy: IDE cables are thatched and out of the way, the power cable is bundled neatly along the top near the power supply, and all the ports and bays are accessible. There are five PCI slots (three available), one AGP slot, six 3.5-inch bays (two available), and four 5.25-inch bays (two available). There are two busy case fans, a 450-watt Enermax Whisper power supply, and a large Cooler Master P-4 heatsink and fan.

Performance. The Mach V soared effortlessly through our benchmarks: The SYSmark2002 score was 239 (286 in Internet Content Creation and 200 in Office Productivity); the PCMark-2002 Pro scores were high (6,268 CPU, 6,545 memory, and 1,833 HDD); and the 3DMark-2001 score was out of the ballpark at 11,890.

The DVD and audio CD I played looked and sounded awesome, but no more so than many less expensive configurations that also use the Klipsch speakers. In my Quake III tests, I found nothing to complain about. Running Demo 1 at a 640 x 480, the machine delivered 289.3fps, 206.8fps at 1,280 x 1,024, and 152.3fps at 1,600 x 1,200. No, those numbers aren't typos.

Final word. If you're a subscriber, go to www.smartcomputing.com (CPU's site is coming soon). Check out the top five high-end desktops. You'll see why this Mach V is tops. 'Nuff said. ▲

by Cal Clinchard



Mach V

\$5,260 (without monitor)

Falcon Northwest

(888) 325-2661

(541) 552-1140

www.falcon-nw.com



Processor:

2.53GHz
Pentium 4

RAM: 512MB
PC1066 RDRAM

Hard Drive:
230GB (three
82.3GB hard
drives)

Optical Drive:
Plextor
PlexWriter
40X12X40X
CD-RW; Toshiba 16X
DVD-ROM

Connectivity: 10/100
Ethernet and modem

Chassis:

Tower

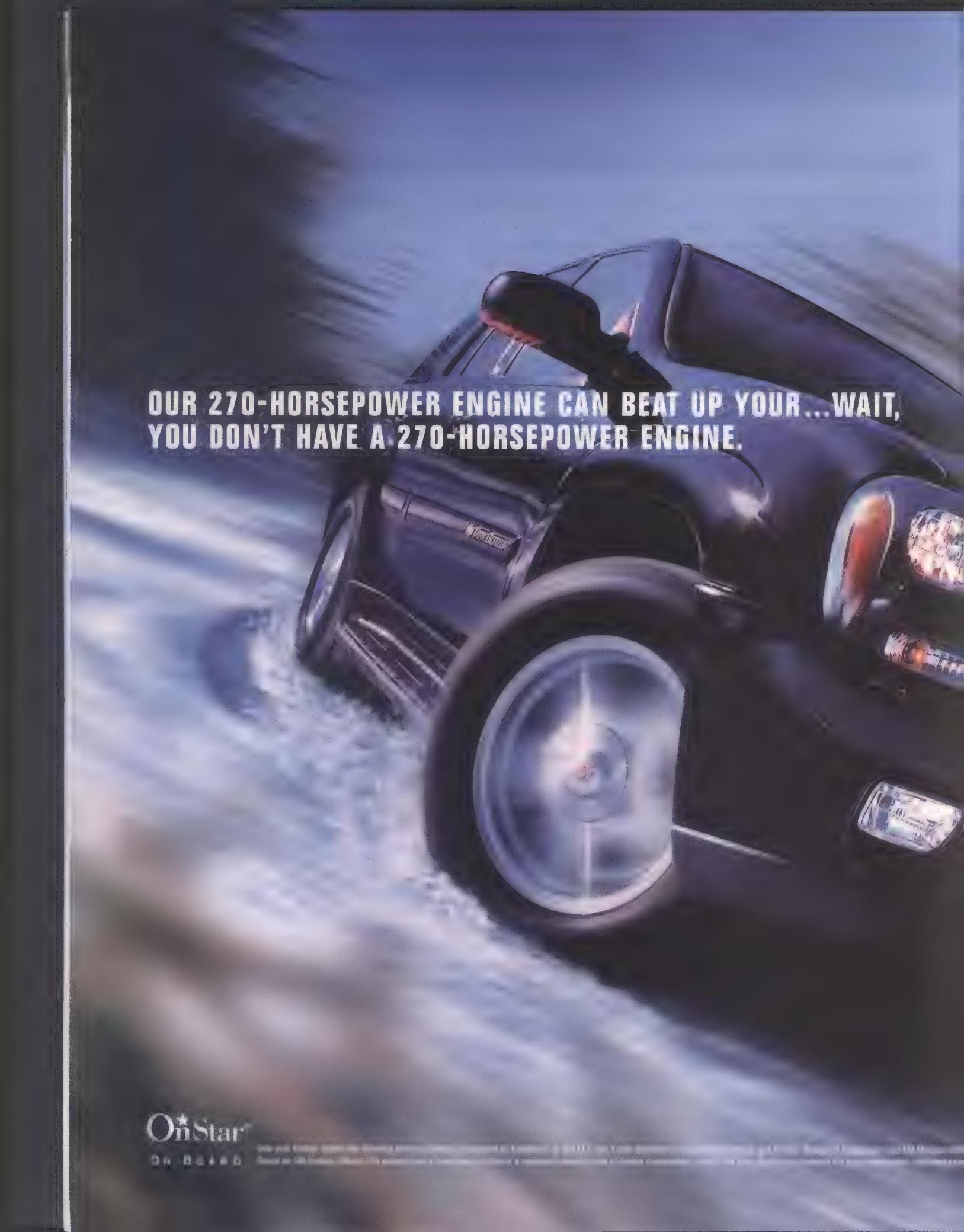
Monitor:

N/A

System Use:

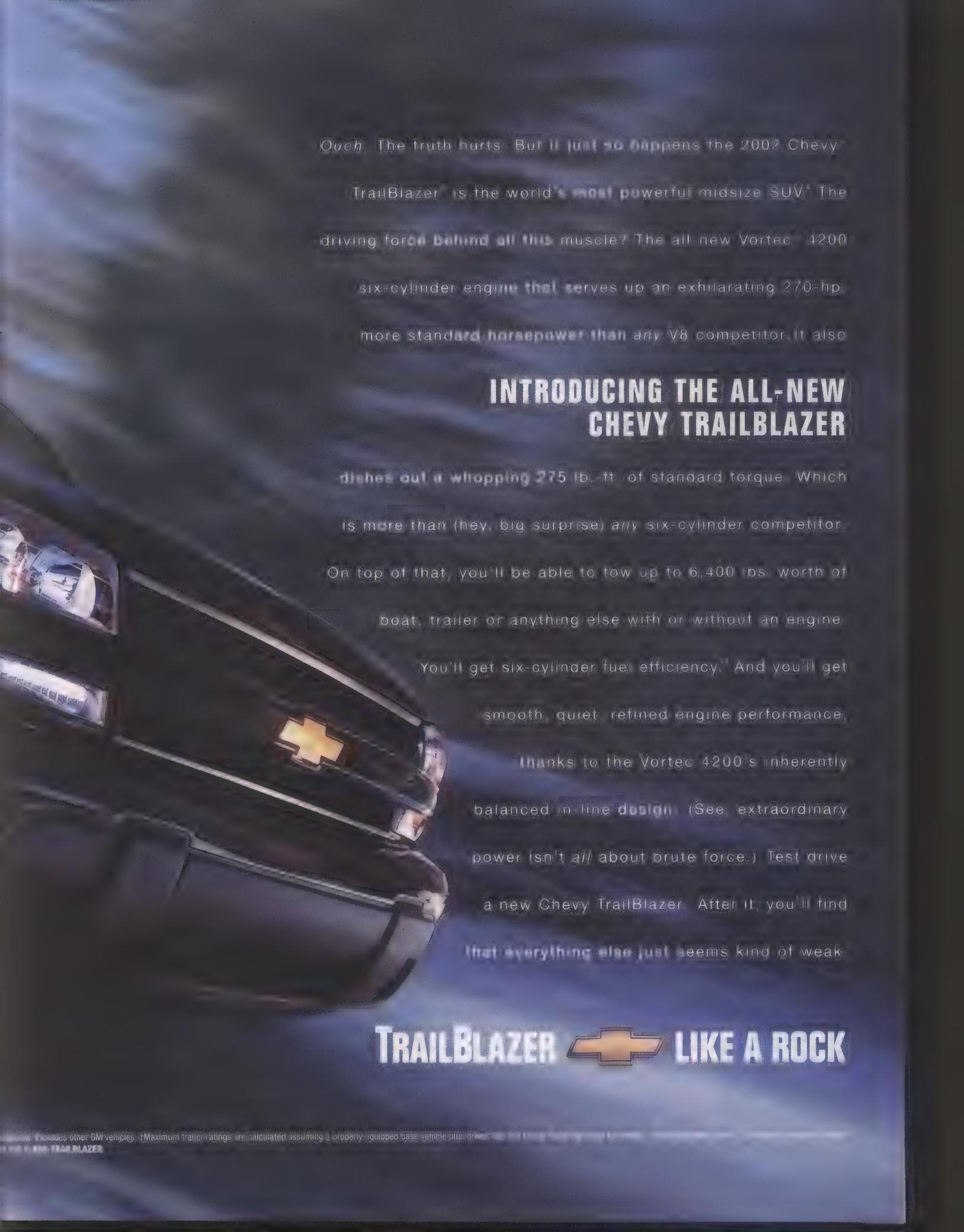
Entertainment

Final Word: Current top
of the heap.



OUR 270-HORSEPOWER ENGINE CAN BEAT UP YOUR... WAIT,
YOU DON'T HAVE A 270-HORSEPOWER ENGINE.

OnStar
ON BOARD



Ouch. The truth hurts. But it just so happens the 2002 Chevy TrailBlazer is the world's most powerful midsize SUV.* The driving force behind all this muscle? The all-new Vortec 4200 six-cylinder engine that serves up an exhilarating 270-hp more standard horsepower than any V8 competitor. It also

INTRODUCING THE ALL-NEW CHEVY TRAILBLAZER

dishes out a whopping 275 lb.-ft. of standard torque. Which is more than (hey, big surprise) any six-cylinder competitor. On top of that, you'll be able to tow up to 6,400 lbs. worth of boat, trailer or anything else with or without an engine. You'll get six-cylinder fuel efficiency.* And you'll get smooth, quiet, refined engine performance, thanks to the Vortec 4200's inherently balanced in-line design. (See, extraordinary power isn't all about brute force.) Test drive a new Chevy TrailBlazer. After it, you'll find that everything else just seems kind of weak.

TRAILBLAZER LIKE A ROCK

*Compared to GM's 2002 midsize SUVs. Excludes other GM vehicles. *Maximum trailer ratings are calculated assuming a properly equipped base vehicle plus driver. ©2002 GM Corp. TRAILBLAZER

Preparing For Prescott

I had been hearing about Intel's Prescott CPU for a while, but it wasn't until the Intel Developer Forum back in February that Intel officially acknowledged the codename. Set to be the successor to the Pentium 4, and dramatic enough of an improvement in order to warrant calling it a Pentium 5 even, the Prescott core will bring a number of high-performance improvements to Intel's flagship CPU line.

I've mentioned Prescott briefly before in previous columns, but this time there's some information about Prescott's platform that I'd like to share as well. Before we get to that, let's recap what we know about Prescott thus far.

Prescott will be built on Intel's 0.09-micron manufacturing process; current Pentium 4s based on the Northwood core are using a 0.13-micron process. The reason for an aggressive push down to a 0.09-micron process is so that they can keep manufacturing costs under control despite the large cache and other architectural enhancements. Moving down to a 0.09-micron process gives Intel a reduction in die size of about 52%, assuming all other factors remain the same. In reality, we'll see an even larger reduction due to transistor level optimizations, but the die savings won't sit idle: Intel will be outfitting Prescott with a number of enhancements.

Prescott will feature an extremely large 1MB L2 cache, twice the size of the current-generation Pentium 4 and even larger than AMD's Athlon will have in 2003. The 1MB L2 cache will increase the transistor count of Prescott tremendously over the current Northwood Pentium 4, with the CPU weighing in at close to 100 million transistors.

The CPU will also feature other architectural enhancements such as HyperThreading (see the January 2002 column on the Pentium 4's future), among other things (potentially 32-bit double-pumped ALUs instead of the 16-bit double-pumped ALUs the Pentium 4 currently has). Intel will also initially bump the FSB of Prescott (referred to internally by Intel as a Processor Side Bus or PSB) to 166MHz quad-pumped. This offers PSB bandwidth equivalent to a 667MHz FSB or 5.3GBps.

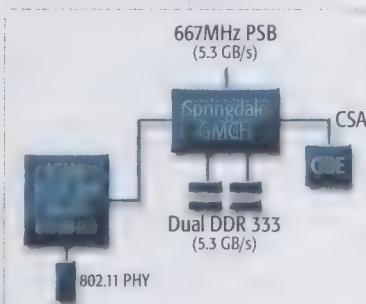
What's truly exciting about Prescott are the chipsets that will be available around its release. Just

before Prescott's release in the middle to end of 2003, Intel will be releasing its Springdale chipset, which will be the platform of choice for Prescott. Springdale will support both the 533MHz FSB for today's Pentium 4s as well as the 667MHz FSB for Prescott, indicating that Prescott may even use the same Socket-478 as today's current P4 CPUs. The chipset (see graphic below) will also feature a dual-channel DDR333 memory controller which offers an equal amount of memory bandwidth as the PSB (5.3GBps); it's important to note that there's no mention of a RDRAM chipset for Prescott yet, which goes along with things I've been hearing from motherboard manufacturers; it doesn't seem like there will be much RDRAM in the near future for Intel platforms.

Intel will also be introducing a new CSA (Communications Streaming Architecture) with Springdale, which will essentially be a dedicated bus for high-speed networking (e.g. Gigabit Ethernet) stemming from the Springdale MCH (Memory Controller Hub; aka North Bridge).

The Springdale ICH (I/O Controller Hub; aka South Bridge) is where most of the interesting technology will be contained. Not only will it support USB 2.0 and Serial ATA but the new ICH, dubbed ICH5, will have a built-in Wireless Ethernet MAC. Currently the specifications for ICH5 state that a 802.11b MAC will be included in the South Bridge, but this could eventually change to offer 802.11a or even 802.11g support. This means that all motherboard manufacturers will have to do is supply a relatively inexpensive physical layer on the motherboard and an antenna bracket for your case, and you'll have very cheap wireless networking in your PC.

In about a year, this is what you'll have to look forward to: a very fast CPU running at speeds greater than 3GHz (I'm expecting closer to 4GHz at Prescott's launch), a feature-rich dual-channel DDR platform, and integrated wireless networking. We're finally getting rid of those annoying cables, folks, one step at a time. ■



Anand's listening at anand@cpumag.com.

Anand Lal Shimpi has turned a fledgling personal page on GeoCities.com into one of the world's most visited and trusted PC hardware sites. Anand started his site in 1997 at just 14 years old and has since been featured in USA Today, CBS' 48 Hours and Fortune.

His site—www.anandtech.com—receives more than 55 million page views and is read by more than 2 million readers per month.



NVIDIA's Cg: A New Hope?

I recall abusing this space a few months back and getting a bit (cough) moody: like Yoda's outburst in Episode II. The part where he leaves behind Frank Oz's hand and goes postal with his lightsaber. That level of moody. "See here!" I thought, "You are paying handsomely for newly released 3D cards that have all kinds of fancy rendering capabilities, which are mostly used for so-so demos. Meanwhile everyone is still playing Counter-Strike or even a new FPS (albeit faster), based on the aging Quake III arena engine!" 3D chips are pushing technology innovation at a pace that most game developers just can't match. Rarely do we see actual use of programmable pixel and vertex shaders (apart from rotor effects on H₂O in Comanche), which is a crying shame. They really do give the few games that use them (AquaNox is one) a rather unique look. But unlike much game code, written in a high-level language like C or C++, shaders have been written in cumbersome assembly code. NVIDIA has been painfully aware of this "implementation gap" and has initiated a new release (settle down, it's not NV30), developed with Microsoft's "participation," dubbed "Cg."

"What FORTRAN was for mainframes and C was for the PC, Cg will be for the GPU." At least that is how NVIDIA is characterizing this leap. Perhaps the company is right. At the very least, this could be a step in the right direction if it allows developers an easier path to integrate advanced GPU capabilities, like programmable shaders, into the current crop of next-generation games. Cg breaks down into two main parts: the "industry-standard" Cg programming language itself, and the Cg runtime compiler.

Cg or "C for graphics" is a high level programming language, like C, designed for use in programming advanced GPUs. It is 100% compatible with DirectX 9 high-level shading language. Cg allows the programming of GPUs intuitively, using familiar language constructs instead of arduous assembly code. This language allows developers to create usually large and complex functions requiring lines upon lines of code, but instead with much simpler and less time-consuming command strings. When implemented in a game, the Cg runtime compiler creates the particular instructions needed at load time to run on that specific platform. The Cg compiler produces commands, in

either DirectX or OpenGL, telling the API how to render the actual effect on the screen.

The Cg compiler has "open-source key compiler components" and sports a "Unified Compiler Architecture." Although it does work with other GPUs, it has obviously (and understandably) been better optimized for NVIDIA's chips. "The NVIDIA Cg Compiler outputs standard Vertex and Pixel Shaders for compatibility with all DirectX 8-compliant hardware, while giving you additional optimization, performance, and flexibility for NVIDIA platforms." This is an important quote from NVIDIA. So much of the final success of Cg for all consumers (not just NVIDIA product owners) depends on the degree to which it is truly an open standard that works well on "all DirectX 8-compliant hardware." If other GPU makers are willing and able to create their own runtime compilers using the Cg language and/or

custom extensions, this could be a real breakthrough. But if NVIDIA has skewed the advantage too far toward its own hardware, this could turn into a setback for developers or a serious detriment to other hardware manufacturers. How necessary Cg will be once DirectX 9 and OpenGL 2.0 become available is another question, as each API will incorporate high-level shading language. (3Dlabs currently offers downloadable source code for its OpenGL Shading Language Compiler, based directly on the proposed specs for 2.0.) Only time and maybe John Carmack will tell.

The trial version of the Cg toolkit is available for download at developer.nvidia.com/cg and supports DX 8 vertex and pixel shaders and OpenGL 1.3 (using NV_vertex_program). Another site (cgshaders.org) has been set up for shader swapping and discussion. But game development cycles are long, with many a winding road and probably set in stone for this Christmas, so don't expect this to happen overnight. Look for developers to utilize Cg for DX9 and so on. If that happens, I'll stop being so moody and find something else to whine about, like AI. They do say to be careful what you wish for, don't they? ■

*Nearly do we see
actual use
of programmable
pixel and
vertex shaders.*

Disrupting Reuters' newswire with a cheery Christmas greeting at age six, Alex "Sharky" Ross became an avid computer user/labuser, eventually founding popular hardware testing/review Web site

SharkyExtreme.com.

Exposing shoddy manufacturing practices and rubbish-spouting marketing weasels while championing innovative products, illuminating new technology, and pioneering real-world testing methods was just a front for playing with the best toys. The site acquired, he left in 2001. A London native and London School of Economics graduate, Alex currently swims in Silicon Valley.

Email me at sharky@cpumag.com, and I'll send you 1,000 lines of code.

Showing Off

I spent the first week of June in Taipei, Taiwan, at what is easily my favorite show of the year. If you are a hardware geek in any way, shape, or form, the Computex show will undoubtedly leave your head spinning, as nowhere else on the planet will you find a higher per capita rate for CPUs, chipsets, mainboards, and video cards.

Since Taipei is the mainboard and video-card builders' backyard, they are there, and they are there with bells on. They are showing off their entire product lines in booths heavily staffed with employees on the prowl to promote their wares. What is really interesting is getting to peek at some of the stuff that has not been officially announced yet. Sometimes you get sneak peeks on accident, and other times, you get shuffled into darkly lit back rooms where only code names are allowed to be used.

ATI most likely took the prize for showing off when it did not want to. It seems as though a misunderstanding by a person helping set up the VIA booth led to the new ATI R300 being put in the spotlight for a couple of days, just no one really knew it. Pictures soon popped up on the 'Net, and we have it on good information that ATI sent its hardware hit squad to relieve VIA of the R300 and then safely deliver it back to where prying eyes could not intrude. 700MHz DDR memory was seen on the R300 card, as well as it running live demos while using an 8X AGP bus.

Interestingly enough, the mainboard it was running on has yet to officially be announced either, but they could be found nearly everywhere on the show floor. The anticipated VIA KT400 for the AMD Palomino and Thoroughbred cores was a hot topic of discussion. The KT400 is going to deliver 400MHz DDR, along with native serial ATA and USB 2.0 on-chip. Sadly though, tangible performance increase over current 333MHz DDR systems using the KT333 chipset is highly unlikely, as AMD's non-advancing CPU bus speed continues to cripple the AMD CPUs.

VIA also showed off a dual Pentium 4 CPU system. Not on purpose, but rather it seems someone

had been a bit careless before a scheduled press tour of the VIA offices. "Hey Billy Joe Bob! Does that look like one of them new-fangled Dually P4 systems over there on Johnny Chen's desk?" "Oh, right you are." While, of course, there was not other information associated with it, it was nifty to see that it could be done.

Also on the VIA front, we are almost guaranteed to see a dual-channel DDR chipset out for the Pentium 4 soon going by the name of "P4X600." Seems as though dual-channel 333MHz DDR would be much better with the name "P4X666," but there seems to be a marketing issue with that. While I am not too optimistic about the fate of the KT400, conversely, I am very excited about the P4X600. This should be the chipset that settles all those RDRAM arguments once and for all. Cheap P4s on the shelves with cheap dually DDR—it should be a gamer's upgrade dream. We will have to wait and see.

How could you talk about new stuff without talking about AMD's upcoming Hammer CPU

What is really interesting is getting to peek at some of the stuff that has not been officially announced yet.

for the desktop? It was pretty obvious that AMD dropped a pretty sizable chunk of cash on promo for Hammer at the show. One Intel executive even mentioned to us that AMD had outspent Intel for once. While the hype seems to be a bit premature, we are very likely to see retail desktop Clawhammer CPUs available in Q103.

Lastly, word on the street is that AMD's Thoroughbred 0.13-micron CPU is plagued with production issues, but Richard Heye, VP with AMD, assured us that Thorough would be in good supply by the time you are reading this. Oddly enough, while 800MHz Hammer test samples were nearly a dime a dozen, there was not one TBred CPU to be seen. We have much more Computex coverage over at [H]ardOCP if you are interested. ■

Talk with Kyle at kyle@cpumag.com.



Kyle Bennett is editor-in-chief of HardOCP.com, one of the largest and most outspoken PC-enthusiast sites on the Web. HardOCP.com is geared toward users with a passion for PCs and those who want to get cutting-edge performance from their systems. Beware, though, Kyle is known for his strong opinions and stating them in a no-nonsense manner while delivering some of the most in-depth reviews and PC hardware news on the 'Net.

tomorrow
morning,
will you choose
to give 110%?

75%?

33%?

14%?



Meet the newest Harvest bar. The delicious morning energy bar from PowerBar. Made with sweet raisins, whole oats, and dipped in yogurt. Plus it's loaded with soy protein, and 16 essential vitamins and minerals for the energy to help you power through your morning. So grab one. And give it your all. Maybe even a little more.



PowerBar

Be great.

Each month we ask a staff writer to take on our publication editor in a challenge to build the best PC for a certain price. Because our writers don't want to lose their jobs, they always accept this challenge willingly. Tempers will flare. Tools will fly. But only one will prevail.

This month the challenge is to build the **Best system for a college student for less than \$1,000.**

Samit

So this month we had to build the best system for a college student for less than one Grover Cleveland (but feel free to send me a few Woodrow Wilsons and I'll happily build you a system or five as long as the change stays with me). Building a PC for the college student isn't really a difficult task but one that's very easily customizable to individuals. Sure, I've been out of college for a few days, but I can still visualize my needs for a PC whilst working on my BSBA and, later, MCSM at Creighton University (Omaha, Neb.).

I set upon a quest to build a machine that would have best served me in school: I needed a machine that could compile code quickly, run my neural network projects in ample time, and fly through mind-numbing SAS calculations. That's not all; I needed to type my papers, work on projects, and have a connection to the computer labs (for printing, transferring files, and so on). But wait, there's more: I had to meet my entertainment needs with television, TV-On-Demand, DVDs, music, and gaming. That led me to this month's system: The I2K2-DCE (Insidious 2002 Degree Crunching Entertainment) PC.

Let's start with the low-tech: in this case the free Memorex spill-proof keyboard. Oh yeah. Pools of drool from those all-night cramming sessions? No problem. Coffee? Tough luck, bub, better

keep typing. Beer spills? Muahahahaha, your next beer will be mine, kid. Worse? Well, hey, it's your keyboard, so keep your stomach juices to yourself (and learn some control, buddy). But as it tends to, the Insidious mind wanders once again.

The I2K2-DCE PC features 512MB DDR, an Athlon XP 1800+, and two optical drives. It saves you tons of cash by replacing your need for a TV, VCR, DVD player, and stereo. (You can even record a show while watching a DVD.) All that, and you can play the latest games with ease, thanks to the ATI All-In-Wonder 64MB RADEON 8500DV. Hey, and this video card will be a nice option for your second machine after university, too.

I opted for a Sound Blaster 5.1 even though the mobo had built-in audio for the best compliance in games and audio. However, for those in need of a printer, feel free to skip the \$38 sound card and spend the money on a cheap inkjet with a good rebate (saw a Lexmark Z13 for \$9.98 at Office Max). I never printed anything in either the dorms or off-campus housing because I always felt it was a waste of natural resources. Instead, I did my work digitally and printed my final projects on the laser printer in the labs. Never had to buy inkjet refills, deal with paper jams, or waste paper.

I considered an MP3 player (use your Discman), headphones (comes with your Discman), digital camera (wait for the 7+ megapixels after college), and other gadgets (save your money, child!) but at the end of the day, all of these things would have compromised the soul of the

I2K2-DCE. When a system is all it can be, it's called the

Insidious 2K2-DCE. Now where's that Domino's slice and Old Mil I put behind the couch last night? ▲



**THE
PC CHA**

Samit Choudhuri
Publication Editor
Computer Power User

Component	Model	Price
Case	Apex ATX Mid Tower TU-129 (350W) ¹	\$59
Motherboard	BioStar M7VIB VIA-KT266A ¹	\$59.99
Processor	AMD Athlon XP 1800+ ¹	\$119
Memory	512MB (2X 256MB DDR-SDRAM PC-2100) ¹	\$79.98
Hard Drive	Maxtor 60GB 7,200rpm ^{2 *}	\$114.99
Video Card	ATI All-In-Wonder RADEON 8500DV 64MB (OEM) with RF Remote ⁵	\$209
Sound Card	Built-in + Creative Labs Sound Blaster 5.1 (OEM) ¹	\$34.99
Network Card	Netgear FA311 10/100 PCI ^{2 *}	\$9.99
Modem	I'd rather walk to my data, thanks.	N/A
CD-RW	Pacific Digital 32X12X48X CD-RW ^{2 *}	\$89.99
DVD-ROM	EPO Technology 16X DVD-ROM ^{2 *}	\$59.99
Diskette	Samsung 1.44MB FD ⁵	\$6
Monitor	Samtron 76DF 17-inch DynaFlat ^{4 *}	\$169.99
Speakers	Powered 2.1 (580W PMPO) ³	\$7.95
Mouse	Memorex PS/2 Mouse ⁴	\$6.99
Keyboard	Memorex TS1000 (spill-proof) ^{4 *}	\$12.99
Operating System	WinXP Home Edition (OEM) ⁵	\$88
Software		
Norton Anti-Virus 2002, OpenOffice.org 1.0 Office Suite (or buy MS Office with your educational discount), Nero 5.5, WinDVD, ATI TV /PVR software		N/A
Miscellaneous		
ATI Video Dongle/Hub, TDK 50-pack 32X CD-Rs ^{2 *}		\$14.99
Subtotal		\$1,143.83
Shipping		\$13
Tax		\$48.23
Rebates		-\$206.99
TOTAL		\$998.07

Purchased From:
 1 DTCorp
 2 CompuUSA
 3 Computer Geeks

Best Buy
 5 NewEgg.com
 Items with a rebate

CHALLENGE



Kylee Dickey

Staff Writer
Computer Power User

Component	Model	Price
Case	Apex ATX Mid Tower TU-129 (350W) ¹	\$59
Motherboard	BioStar M7VIB-A ¹	\$188
Processor	AMD Athlon XP 1800+ (included with motherboard)	N/A
Memory	256MB DDR-SDRAM PC2100 ²	\$32
Hard Drive	WD 40GB 7,200rpm ³	\$60.95
Video Card	ATI RADEON 7000 ⁴	\$35
Sound Card	Integrated into motherboard	N/A
Network Card	Realtek 10/100 PCI ⁵	\$4.95
Modem	ESS Teledrive 56Kbps ⁵	\$9.95
CD-RW	BusLink 32X12X40X ⁶ *	\$99.99
DVD-ROM	Artec 16X DVD-ROM ⁵	\$44.50
Diskette	1.44MB 3.5-inch Samsung floppy drive ¹	\$9.95
Monitor	Mag 770FS 17-inch ⁶ *	\$139.99
Speakers	Kinyo 120 Watts two-piece Multimedia Speakers ¹	\$4.99
Mouse	Logitech Optical Wheel Mouse Special Edition-Red ⁷	\$25.88
Keyboard	Memorex MX-2750 ⁷	\$17.09
Operating System	WinXP Home Edition (special pricing when purchased w/motherboard) ¹	\$99.99
Software	Norton AntiVirus 2002 (included with motherboard), PowerDVD (included with DVD-ROM), OpenOffice.org 1.0 Office Suite (free download), Nero Burning ROM 5.5 (included with CD-RW drive), and Ulead Photo Explorer 6.0 (included with Web cam)	N/A
Miscellaneous	PNY 50-pack 16X ¹ *	\$14.99
CD-Rs	Philips ToUCam XS (PCVC720K) ⁹	\$19.99
Web cam	6-foot cable ¹	\$4.98
USB cable	Lexmark Z25 ⁸ *	\$79.99
Printer	AIWA HPCN5 Noise-cancelling headphones ⁶	\$49.99
Headphones		
Subtotal		\$1,002.16
Shipping		\$37.40
Tax		\$48.87
Rebates		-\$130
TOTAL		\$958.43

Purchased from:
 1. DIT
 2. buyab.com
 3. z-buy.com
 4. NewEgg.com
 5. ComputerGeeks.com
 6. BestBuy.com
 7. buy.com
 8. Circuit City
 9. Madlogix

*Items with a rebate

Kylee

When I was in college, we didn't watch DVDs on our PCs. We walked 10 miles uphill in a blizzard just to make a cassette-tape copy of our friends' R.E.M. and They Might Be Giants albums. It's no wonder the system I built makes my old dorm-room PC resemble a dinosaur.

Students have many different interests, so I shied away from a system that excels in just one area. Instead, I built a PC as well rounded as a liberal arts student. I dare the Insidious One to do the same. I started with an Apex ATX Mid Tower TU-129 with two USB ports in the front, a 17-inch Mag monitor, a BioStar M7VIB-A motherboard with a bundled AMD Athlon XP 1800+ processor and Norton AntiVirus 2002, a WD 40GB 7,200rpm hard drive, and 256MB DDR-SDRAM PC2100.

I bought both a Realtek 10/100 PCI network card for dorm-room connections and an ESS Teledrive 56Kbps modem for summer breaks at home. Making trips to a networked computer lab didn't sound like fun, so I also bought a Lexmark Z25 inkjet.

Students need study breaks, so I bought a BusLink 32X12X40X CD-RW drive and 50 CD-Rs. Another entertainment option: Rent a couple DVDs for the Artec 16X DVD-ROM drive, connect the TV to the RADEON ATI-7000 video card's video-out port, pop some popcorn, and invite the whole gang over! Not all classrooms have



computer equipment, so a student might also connect the PC to a VCR to record some presentations. I added the Philips ToUCam XS for keeping in touch with family and friends. It also bundles Web-cam-controlled games, in which the user's movements control on-screen action.

The Memorex MX-2750 keyboard's multimedia buttons are handy for operating multimedia programs (and in a tiny dorm room, the keyboard's always only a step away). The Logitech Optical Wheel Mouse Special Edition has no exposed parts, making it fairly immune to attacks by finals-week potato-chip crumbles.

Don't worry, parents. I didn't forget that school's for studying. I downloaded the Microsoft-Office-compatible OpenOffice suite. Also, after recalling my tiny, sometimes noisy dorm room, I opted for a small pair of Kinyo speakers with a headphone jack and bought a pair of AIWA HPCN5 noise-cancelling headphones to assist studying sessions by quieting roommates' phone calls and parties down the hall.

This system lets college students do just about anything except skip that 7:30 a.m. class. Now Judge Jennie decides if I've earned an A+ or if my old B-52s albums really are an indication that I'm out of touch with the student body. ▲

And The Winner Is...

Spill-proof keyboard? Gives you a pretty good idea of what Samit was like back in his university days, doesn't it? But let's not dwell on that image. . . . A college PC could be a lot of different things, so it's interesting that these PCs have so much in common. There are some key differences, though. Samit opted for more memory and a bigger hard drive, which is essential for storing a huge MP3 collection and the occasional research paper. The additional sound card is nice, as is the powerful RADEON 8500DV, which gives his PC lots of versatility that could save the cash-strapped student some money. It even comes with a remote so you can surf from bed. Pretty cool. Kylee opted to spend her money on extras such as the inkjet, Web cam, and headphones, which I like. Sure, you can save your printing jobs for the networked lab, but that's not as convenient if you like to proofread on paper. Still haven't called it quits with your high school sweetheart? Use the Web cam to stay in touch (or keep an eye out for signs of the "freshman 15"). And I can think of a few instances when my roommate's boyfriend was visiting that the noise-cancelling headphones would have come in handy. But all these extras can't match Samit's extra memory, huge hard drive, and awesome video card. So although I'm docking Samit for drinking Old Mil, I have to give him the win. Kylee put together a great, useful system, but despite the extras, it's not as powerful and versatile as Samit's.



Jennie
"Makin' The Grade"
Schlüter

Swappin' Parts

Each month in "Swappin' Parts," a Computer Power User writer upgrades one out-of-date component in our test machine, MERLE (Mediocre Electronic Refurbished Low-end Equipment). When we're finished, we will have transformed MERLE from a silicon trash can into a powerful system we'd be proud to put in our own homes. To date, we've updated MERLE's CPU, sound card, speakers, video card, RAM, optical drive, case, PSU, monitor, and motherboard. Wheew.

I remember watching my dad work on the car when I was younger. As his 34-minute project stretched into three hours, you could see the frustration building. Now, I don't know a carburetor from a spark plug, so I avoid working on my car, but on a few occasions, PCs have given me more than enough frustration. As my 40-minute MERLE upgrade stretched into day five, I was ready to begin operating with a sledgehammer.

A Simple Mission?

Compared to last month's "Swappin' Parts," my mission was relatively simple. Last month, Marty Sems upgraded the motherboard, processor, and RAM to give MERLE a significant power boost. My task was to design and install a cooling system. I didn't expect this minor upgrade to be the death of MERLE.

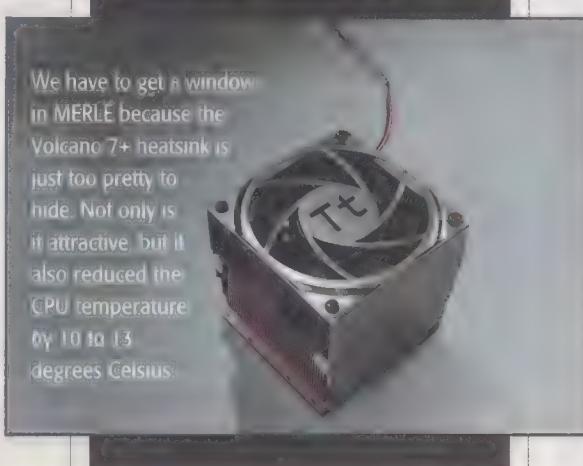
Before we get to the details of MERLE's demise, we should talk about cooling because that was my original assignment. I planned to upgrade MERLE's CPU heatsink and case fans, but I wanted to add a little something extra. Macpower's DigitalDoc5 proved an interesting option.

The DigitalDoc5 (\$74 but cheaper online; www.macpower.com.tw) mounts in

There's A Transformation Taking Place



The DigitalDoc5 mounts in a standard 5.25-inch drive bay and quietly monitors internal temps. I even found one with a silver finish to match MERLE's aluminum case.



We have to get a window in MERLE because the Volcano 7+ heatsink is just too pretty to hide. Not only is it attractive, but it also reduced the CPU temperature by 10 to 15 degrees Celsius.

a standard 5.25-inch drive bay. Using eight probes, you can monitor the temperature in different parts of the case. The DigitalDoc5 can handle up to eight fans, and you can program it to activate the corresponding fan when a probe reports a specific temperature. I installed the DigitalDoc5 first so I could take some before/after measurements.

Chillin' The Athlon

MERLE's heatsink needed to go. Last month, Marty installed a stock AMD

heatsink included in the Athlon XP's box. Although that heatsink did an admirable job, it had a few flaws.

The stock heatsink is a bit small compared to other heatsinks, reducing the overall amount of surface exposure. The heatsink also is made of aluminum. I'm a fan of aluminum (it holds my caffeinated beverages), but it isn't the best heat conductor. Copper is a better thermal conductor, but it's softer and harder to work with, thus increasing the price. The ThermalTake Volcano 7+ (\$42; www.xpcgear.com) has an all-copper heatsink and a 49CFM (cubic feet per minute) fan. Cheaper heatsinks often have CFM ratings of about 30.

Copper's drawback is its weight. The Volcano 7+ is significantly heavier than the stock AMD aluminum heatsink. In MERLE's tower case, the heatsink will put more stress on the plastic tabs that hold it in place. Nonetheless, the gains in cooling are significant enough to warrant the added stress.

Now that I was pulling heat from the processor more efficiently, it was time to improve how I expelled hot air from the case. MERLE already had decent airflow, but I knew I could do better.

With cooling as my number one goal, I obtained a pair of 80mm noise-pollution-be-damned Delta fans (\$18.49 each; www.xpcgear.com). These 4900rpm Delta fans can move 68.5CFM each, and when they are on, your neighbors will know it.

I planned to use the Delta fans together as intake fans. I wired them to the DigitalDoc5 so I could turn them off or program them to come on when needed. For exhaust fans, I purchased a pair of 2,900rpm Sunon (\$8.49 each; www.xpcgear.com) fans than can move 35CFM each. MERLE's case had

room for three 40mm fans near the PCI cards, so I ordered three 40mm Sunon fans (\$7.99 each), each with an 8.9CFM rating.

With the PSU exhaust fan, I had about 130CFM being exhausted from the case and 137CFM coming in. Setting the cooling system to take in more air than it could exhaust created an area of slightly higher pressure in the case to help repel dust.

Wires, Wires, Wires

It was now time to organize MERLE's bird's nest of wires. I started by replacing the traditional IDE cables with rounded ones. I then tucked MERLE's power cables into the crevice between the motherboard mounting plate and the left side of the PC case. Using twist ties, I bound the new IDE cables to the motherboard mounting plate and secured the floppy cable.

The hard drive had been mounted directly in front of the old 80mm fans. I couldn't have the hard drive blocking airflow, so I mounted the hard drive behind the DigitalDoc5.

Sweet Revenge

When it came time to see what evil I had unleashed upon the ears of our unsuspecting lab personnel, the fans spun up, but the system refused to boot. I examined the heatsink to make sure it was properly seated and, to my embarrassment, discovered it was mounted backward. In a midafternoon hunger fit, I didn't think to double-check the heatsink's orientation. I'm assuming this gaffe either cracked the die or didn't properly cool the processor.

I had MERLE's old processor on hand, and it would've taken a few minutes to

swap it, but I refused to believe the processor could've been damaged. I continued to troubleshoot the motherboard until I made my second mistake while trying to clear the CMOS. I failed to heed instructions to disconnect power from the PC and remove the battery before shorting the CMOS jumper to clear the memory. As a result, the motherboard began to smoke the instant I shorted the CMOS jumper. Also, the fans wouldn't switch on.

I take responsibility for killing MERLE, but I remember seeing staff writer Michael Sweet slinking away from MERLE's vicinity one morning. MERLE has drawn blood from Michael on two occasions, and Michael has vowed revenge. I've heard Michael has the fried motherboard mounted trophy-style over his mantle.

Coolness Personified

Once MERLE was breathing again (thanks to a new motherboard and processor), it was time to see if this project was worthwhile. Results show that the upgrade made significant improvements in most areas. The new heatsink reduced the CPU temperature, as ASUS Probe reported, by 10 degrees Celsius when idle and 13 degrees under load. In fact, with the new heatsink, the CPU ran cooler under load than it did before the upgrade when idle.

Placing the 40mm fans next to the PCI slots was a good idea. The temp the DigitalDoc5 reported near the graphics CPU was 6 to 7 degrees cooler, while the temperature around the PCI slots fell 7 to 9 degrees.

There was a slight increase in the hard drive temperature. This was expected because the hard drive no longer enjoys the cool breeze coming off the 80mm intake fans. According to the DigitalDoc5 probe, the temperature around the drive is still only about 37 degrees Celsius when idle, so I'm not too concerned with it.

Overall, MERLE is now considerably cooler and more comfortable than he was last month. Next up, Michael comes back for another go with MERLE. Hopefully Cal Clinchard can play peacemaker and keep MERLE's bloodlust in check as both writers mod MERLE's case. **CPU**

MERLE, You're So Cool

The new cooling system we put in MERLE dramatically reduced temperatures in most parts of his case. Idle measurements were taken after booting MERLE and letting him sit idle for 30 minutes. Load temperatures were taken after running a Serious Sam demo for 30 minutes. All measurements are in Celsius.

Idle

Probe	43
CPU*	27.6
Motherboard*	29.5
Motherboard Heatsink	29.3
RAM	37.3
Hard Drive	23.8
CD-ROM	26.3
PCI	34.7
Outside Temp	34.6
Graphics Chipset	31.2
CPU Heatsink	31.2

Load

Probe	48
CPU*	28
Motherboard*	31
Motherboard Heatsink	30.5
RAM	36.4
Hard Drive	29.4
CD-ROM	34.8
PCI	36.1
Outside Temp	36.7
Graphics Chipset	31.7
CPU Heatsink	31.7

	Temp After	Temp Before	Difference
Probe	43	53	-10
CPU*	27.6	39	-11.4
Motherboard*	29.5	31.3	-1.8
Motherboard Heatsink	29.3	34.4	-5.1
RAM	37.3	79	-41.7
Hard Drive	23.8	25.4	-1.6
CD-ROM	26.3	33.6	-7.3
PCI	34.7	33.8	+0.9
Outside Temp	34.6	33.3	+1.3
Graphics Chipset	31.2	40.5	-9.3
CPU Heatsink	31.2	38.7	-7.5

*As reported by ASUS Probe from motherboard-based temperature sensors.

by Chad Denton

X-ray Vision: XML: The Heart Of .NET

If you're a Microsoft fan, you're probably excited about the possibilities of its .NET initiative. And even if you aren't a Microsoft fan, you must at least be curious about .NET. The .NET initiative promises to provide users with unprecedented access to data through an unprecedented variety of hardware devices. Users should be able to access items such as appointment calendars, personal financial information, and online shopping options from any computing device, regardless of their location.

If you're more than a little skeptical about Microsoft's ability to make this promise a reality, join the crowd. (The back of the line is down the street and around the corner, pal.) However, Microsoft's decision to place XML technology at the heart of the .NET initiative should make that line of skeptics much shorter.

Why XML?

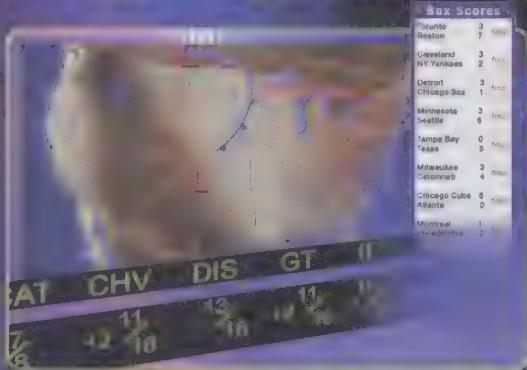
XML is a language used in a variety of Web services and other data exchanges across the Internet, letting a

variety of hardware and software devices communicate with unprecedented success. From XML, Microsoft created XML Web services, which are small programs written in XML that handle individual tasks. In this way, XML will provide the key technology in the communication and administration of .NET services.

In creating .NET, Microsoft turned to the XML language and XML Web services for a variety of reasons. First XML is a great language for letting vastly different software and hardware

XML Web Services Mature

Early XML Web services simply delivered information. Development and incorporation of the technology with .NET has made XML more useful for individuals



The earliest XML Web services consisted of basic information that developers could easily incorporate into their Web pages and applications, including sports scores, weather forecasts, and stock tickers.



With improvements in XML Web services, users can force those applications to filter the basic information to provide only sports scores for their favorite teams, weather forecasts for only their location, or stock quotes for only securities they own.



GT + 2 11/16

Payment
Received

When incorporating .NET with XML, you can further personalize the process. You could have your Web browser display an Excel spreadsheet that shows your entire up-to-date financial picture by constantly downloading the latest data from various sources, including your bank and brokerage.

platforms communicate. Second, XML can transform almost any type of data for display on almost any kind of device. Finally, XML has an admirable track record of success, making it a stable technology.

The idea of stability is a key component in .NET's potential success. The data inside .NET will remain in XML format, making the overall process of data transmission secure and stable. Considering that .NET will involve potentially sensitive personal data, such as personal calendars, contact information, and financial information, stability is vital.

Inside XML

Although XML Web services can consist of several technologies, depending on the company employing them, most encompass three key technologies:

SOAP: Simple Object Access Protocol is the standard communications Web protocol used in XML Web services. The SOAP specification handles a variety of processes, including providing a method for representing program data in XML.

UDDI: Universal Description Discovery and Integration consists of the registration of XML Web services. By registering them, developers

can find the services they need. UDDI represents the 411 of Web services; UDDI gives developers who have XML Web services available a chance to advertise their services and to reach customers.

WSDL: Web Services Description Language documents give developers details about a particular type of XML Web service, letting them build applications for communicating with the XML. Many people describe a WSDL file as an XML document that describes how XML Web services exchange messages, especially SOAP messages. cpo.com

by Kyle Schurman

Put .NET & XML To Work

A restaurant and one of its suppliers want to better communicate through their computer networks about when certain types of specialty foods are available. However, the networks feature different hardware and software setups, making it impossible for them to communicate without an intermediary.

By using XML Web services, the proprietary networks can find a middle ground that lets them communicate. Now the restaurant can know immediately when its supplier has a particular specialty food available, letting it order before its competitors and providing for more flexibility in menu creation.

By adding .NET services to the existing XML connection, a customer can access the restaurant's network and search through the upcoming menus for her favorite entrée. She could also make reservations directly through the restaurant network. Thanks to .NET, the customer can access the network through almost any type of electronic device, from a cell phone to a desktop computer. If the customer provides



permission, the restaurant could automatically set up a reservation for her after it plans a certain entrée by accessing her personal appointment calendar through .NET services.

64-Bit Computing For The Desktop

Here's an age-old riddle for you: When is less really more? In computing, less is really more when you're considering microprocessors. Since Intel introduced the first microprocessor in 1971, improvements in the technology have been fast, furious, and constant. With each subsequent improvement in microprocessors, the transistors on the chip shrink while the chip itself remains stable in size. Less size in transistors yields more transistors on the microprocessor and results in more computing power.

The latest buzz in microprocessors is the continuing shift toward 64-bit processing. Although 64-bit microprocessors have appeared initially only in servers and workstations, the introduction of 64-bit CPUs in desktop computing is approaching.

Intel Microprocessor Timeline

- 1971 4 bits, Intel 4004
- 1972 8 bits, Intel 8008
- 1979 16 bits (8-bit bus), Intel 8088
- 1982 16 bits, Intel 80286
- 1985 32 bits, Intel 80386
- 1993 32 bits (64-bit bus), Intel Pentium
- 2001 64 bits, Intel Itanium

Double Your Pleasure

Most of today's desktop computers use 32-bit microprocessors, such as Pentium 4 chips from Intel or Athlon chips from AMD. Intel has built its 32-bit chips using the traditional x86 architecture (also called IA-32), but it is building its 64-bit chips with a new architecture, called IA-64, or 64-bit Instruction Architecture (code-named Tahoe before its release). The IA-64 chip architecture can transport twice as much data (64 bits) at a time as can IA-32 chips (32 bits). However, that doesn't necessarily yield twice the performance for a few different reasons, including the fact that software companies have yet to release consumer-level 64-bit software packages. (See the "64-Bit's Speed Problems" sidebar.)

Demand continues to grow for 64-bit processing for a variety of computing tasks, including automobile and airplane design, digital-content creation, game development, and financial transactions. A 64-bit processor and operating system combination can more efficiently process extremely large amounts of data. You'll also find that 64-bit processors can handle far more physical memory than 32-bit processors, which usually are limited to 4GB of memory. For example, AMD expects its 64-bit processors to handle as much as 1TB (terabyte) of physical memory.

Certainly, 64-bit computing offers plenty of advantages for high-end users. The advantages for the traditional desktop computing user aren't as obvious, though. For example, as of the time of this writing, no 64-bit software applications for consumer systems were yet available. Still, at some point, experts think 64-bit computing will become commonplace on the desktop because new applications will demand it. Until

then, Intel and AMD have begun to outline plans for their 64-bit processors while maintaining backward compatibility with 32-bit software.

Going Forward . . . & Backward

Although those in the computing and processor industries continue to look to the future with 64-bit processing, they must continue to maintain at least partial focus on the past. Because the vast majority of software products and operating systems introduced in recent years are optimized for 32-bit processing, developers creating 64-bit processors must maintain some form of backward compatibility with 32-bit software. Although companies will begin introducing 64-bit versions of software in the next few years, the 64-bit processors still must guarantee at least partial compatibility with the software products of the past.

Interestingly, Intel and AMD are approaching the idea of building backward compatibility into their 64-bit chips in different manners: Intel has completely reworked its chip architecture with Itanium, looking to incorporate some new ideas to improve performance and speed. Intel scrapped its x86 chip architecture that serves as the basis for most of its 32-bit chips when creating its IA-64 architecture, which Intel first announced in 1994.

However, many experts say these types of radical architectural changes can cause some problems when trying to ensure backward compatibility with 32-bit software. For example, Intel's 64-bit chips will run 32-bit software, but only at a slower speed. Most experts also think the new architecture will go through some growing pains as the company works out some inevitable flaws.

Intel knows some problems with older, 32-bit software will exist on its 64-bit chips, but the company expects users will appreciate the improved performance they'll see with the 64-bit chip enough to cause them to eventually switch to software designed for 64-bit computing.

AMD, meanwhile, is building upon its existing 32-bit/x86 chip architecture to create its 64-bit chip, code-named ClawHammer. Most experts agree this technique will give AMD greater success with backward compatibility with 32-bit software. The reliance on the x86 architecture will let AMD capitalize on sales to users who don't want to invest—at least initially—in new 64-bit applications to achieve the greatest performance results.

However, building upon existing architecture may prevent AMD from incorporating some key technologies that could improve the chip's overall performance. As one industry analyst put it: You're stuck with the mistakes of the past.

Intel's Plans

Despite its early lead in 64-bit computing with the release of the Itanium chip, Intel has not yet announced plans for a consumer-level chip for desktop computers based on the IA-64 architecture. However, Intel started the rumor mill churning in late April 2002 with an announcement that the next version of the Pentium 4 chip would contain extensions to the Pentium 4 instruction set. This announcement followed the widely reported January 2002 rumors that Intel was developing a technology code-named Yamhill that would become a 64-bit processor based on the x86/IA-32 architecture. Yamhill would let the 64-bit processor run 32- and 64-bit software with little loss in performance. (Intel has repeatedly refused to comment on Yamhill.)

Some industry experts think Intel may debut Yamhill technology in its 0.09-micron chips, code-named Prescott. The Prescott chips would be the next version of the Pentium chip and may appear by late 2003. Many of those same experts think Yamhill may or

64-Bit Players

Although only Intel and AMD are expected to introduce 64-bit CPUs for the desktop market, several companies are involved in creating 64-bit microprocessors for the lucrative server and workstation markets. The use of 64-bit chips aid in running processor-intensive computing applications, such as data mining, database management, CAD, and online transactions. With the introduction of new 64-bit chips comes the need for new operating systems that can take advantage of the chip's architecture, too. Here are some of the companies involved in the enterprise market for 64-bit computing.

AMD. Early in 2002, AMD announced plans for its first 64-bit enterprise chip, called Opteron. AMD expects to release its first Opteron in the first half of 2003. (SledgeHammer was the code name for Opteron during its early development.) AMD is aiming Opteron as a direct competitor for Intel's Itanium chip.

Intel. Intel released its first 64-bit processor in May 2001, called Itanium (originally code-named Merced). In April 2002,

Intel improved on its initial 64-bit release with Itanium 2 (originally code-named McKinley). Servers and workstations featuring Itanium 2 were expected to begin appearing in the summer of 2002. In May 2002 tests of Itanium and Itanium 2, Intel claims the Itanium 2 offers improved performance over Itanium by 50% to 100%. Many experts say Intel was attempting to establish its 64-bit architecture with Itanium. The company then was looking to provide significant performance improvements with Itanium 2. Future projected Intel 64-bit chips include those with code names Madison, Deerfield, and Montecito.

Experts think Madison and Deerfield will be budget versions of the Itanium chip and will be introduced in mid-2003, while Montecito will be a high-end Itanium due in 2004.

Linux. Several versions of the Linux operating system exist that have supported 64-bit computing for the past year or so. Most of the companies that offer commercial versions of the Linux OS also offer 64-bit Linux.

Microsoft. Many servers and workstations

that feature Itanium chips also feature Microsoft's 64-bit operating system, called Windows Advanced Server, Limited Edition, which Microsoft released in August 2001. Microsoft also announced in May 2002 that an updated version of Windows Advanced Server, Limited Edition 1.2, will feature support for Itanium 2. Microsoft also has announced plans to include support for AMD's Opteron chip within its 64-bit operating systems. (Traditionally, Sun Microsystems and Silicon Graphics have dominated the 64-bit operating system market.)

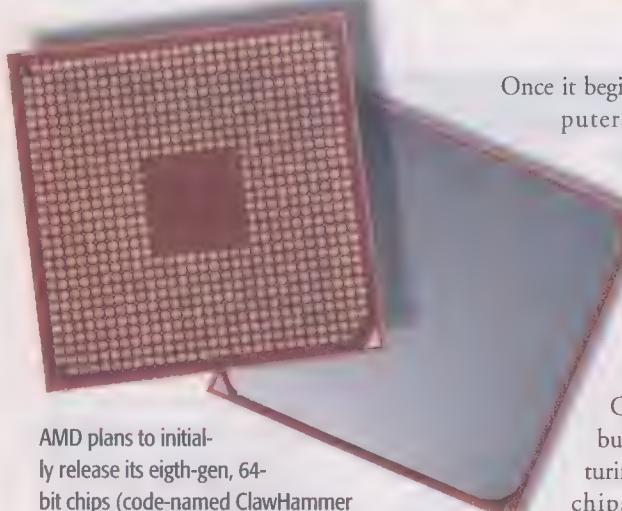
Sun, IBM, & HP

These three companies have long dominated the enterprise chip market and high-end server market with their 64-bit RISC microprocessors. In addition to offering servers based on their own microprocessors, IBM and HP are offering servers featuring Itanium chips. Sun plans to stick to servers featuring its own 64-bit chips. In addition, Sun and IBM have offered 64-bit versions of the Unix operating system for a few years.

may not make the market, depending on the success of its IA-64 chips, including the Itanium family made for workstations and servers. (See the "64-Bit Players" sidebar.) If the Itanium chips, especially the recently introduced Itanium 2, enjoy some solid success, Intel probably will turn its focus to

IA-64 chips for the desktop environment, as well.

However, if Intel's IA-64 work turns out to be a failure, Yamhill would move from "Plan B" to "Plan A." And, experts worry that those companies and individuals who were early adopters of IA-64 technology may be left behind.



AMD plans to initially release its eighth-gen, 64-bit chips (code-named ClawHammer for the consumer market) late in 2002.

AMD's Ideas

Most experts think AMD will continue playing catch-up to Intel in gaining market share in the 64-bit microprocessor arena. However, many experts also think AMD might be able to gain a quick foothold in the 64-bit consumer desktop chip market before Intel moves.

AMD plans to enter the 64-bit desktop and notebook markets with a new set of chips, currently code-named ClawHammer (also sometimes called the eighth-generation Athlon architecture).

Once it begins appearing in desktop computers late in 2002, the 64-bit microprocessor should take on a version of the Athlon brand name. (AMD has called nearly all its chips aimed at the desktop market in the past few years by the Athlon brand name.) The initial ClawHammer chips should be built on 0.13-micron manufacturing technology. ClawHammer chips should migrate to 0.09-micron manufacturing technology sometime in the second half of 2003.

By introducing desktop and notebook versions of its 64-bit chip, AMD is banking on the idea that consumer demand will grow for high-end software and better computing performance in the next few years. AMD also believes the support for 32-bit applications it will build into its ClawHammer chips will make it a popular choice while users make the transition from 32- to 64-bit computing. By including 32-bit support in its new chips, AMD hopes to ease the transition from 32- to 64-bit computing

as much as possible for users and IT managers. Under this option, users should be able to make the migration at their own speed.

AMD developed ClawHammer in conjunction with its 64-bit microprocessor for the high-end server and workstation market, which it code-named SledgeHammer. AMD has code-named its entire 64-bit processor family the Hammer family.

AMD created some buzz over ClawHammer in June 2002 with a demonstration of its new AGP8X graphics technology. AGP8X is designed for optimization when used with ClawHammer. In the same month, NVIDIA announced that its nForce processor and GeForce GPUs will take full advantage of the features found in ClawHammer.

In April 2002, AMD made a move toward building 64-bit chips aimed at less traditional computing devices, such as handheld computers and cell phones. AMD licensed the 64-bit MIPS64 instruction set architecture from MIPS Technologies, which will let it attempt to develop new chips for a variety of products.

64-Bit's Speed Problems

It sure seems like easy math. A 64-bit processor can handle twice as much data at one time as a 32-bit processor; therefore, the 64-bit processor should operate about twice as fast at the 32-bit processor. When you consider the nature

of computing, though, it probably should not be too surprising that this easy math is anything but easy.

In reality, unless you're performing a task that can press the limitations of the 64-bit processor and is optimized to use

the 64-bit processor, you might not notice much improvement in speed or performance from a 64-bit processor. This seemingly strange phenomenon can occur for a few reasons, including coding limitations, cache errors, and nonoptimized software.

Because of the limitations in 8-bit processors, they could handle only integers ranging from -127 to 128 (after they're translated to base-2). As you can see from the graphic on the left, a 64-bit processor can handle integers in an extremely large range. However, very few programming codes make use of integers larger than what a 32-bit processor can handle, which negates some of the performance improvement expected in a 64-bit processor. Because most processors can handle only one instruction at a time and yield one result, an instruction requiring small integers can often be handled equally efficiently by a 32-bit or a 64-bit processor.

8-bit	128
16-bit	32,768
32-bit	2,147,483,648
64-bit	9,223,372,036,854,775,808
	0

Don't Forget The Windows

As the migration from 32-bit CPUs to 64-bit CPUs begins to heat up, the migration of software will follow. And, of course, the introduction of new software versions will include a new 64-bit version of the Windows OS.

Microsoft already has released new 64-bit versions of enterprise operating systems. Windows XP 64-Bit Edition appeared in May 2001. Microsoft has aimed this brand of Windows XP at workstation users running high-performance software, such as 3D animation and scientific applications.

Microsoft has announced plans to offer support in its operating systems for Intel and AMD's 64-bit processors. In recent months, Microsoft chairman Bill Gates has said migrating from 32-bit OSes to 64-bit OSes will be easier for software developers than the move from

16- to 32-bit software because the newer architectures are easier to use.

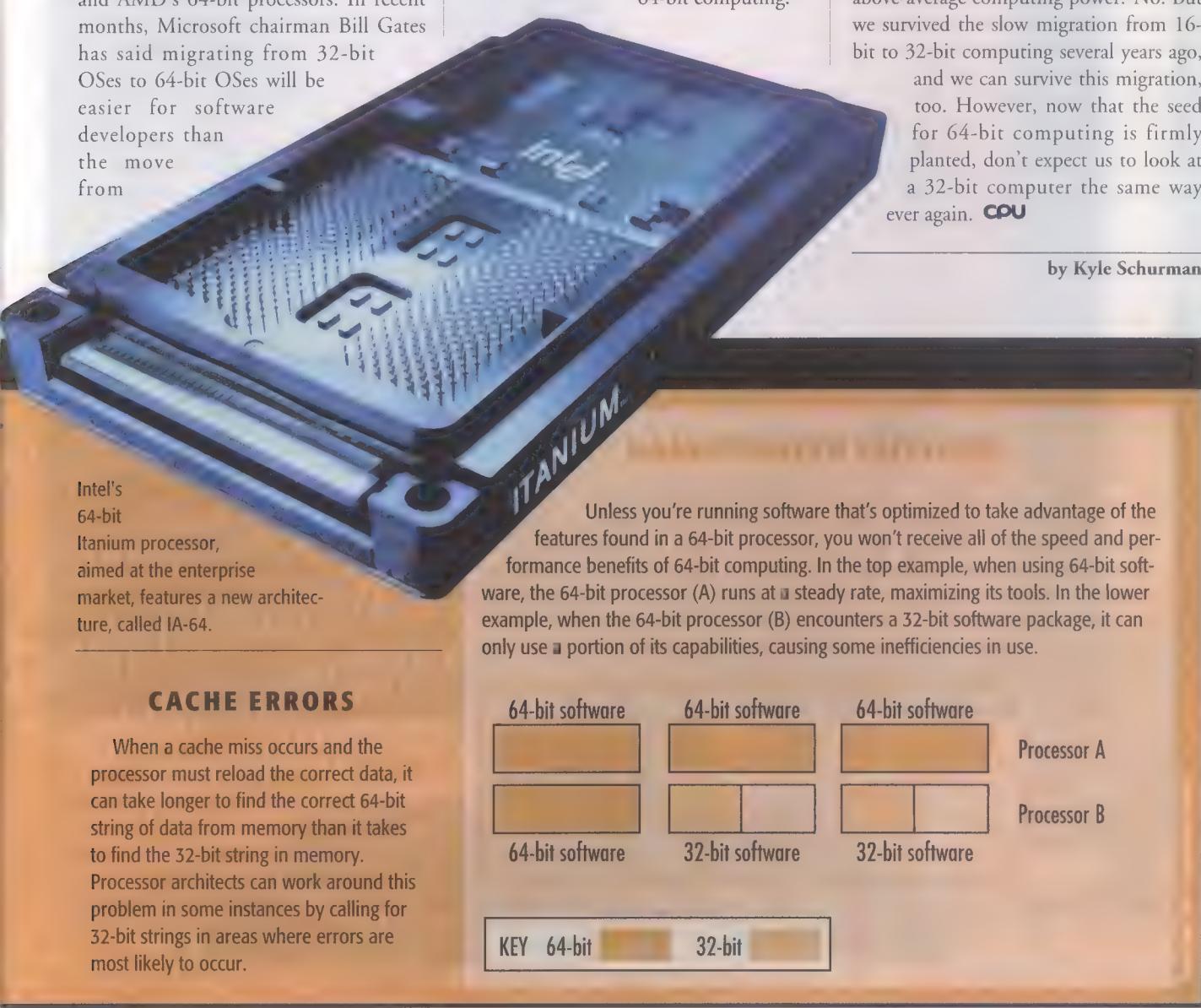
Simmer Down, Simba

Are you ready yet to toss your old clunker of a computer into the trash and head out to buy the latest 64-bit computer? We're going to have to ask you to put down the computer case and step back. Easily finding desktop and notebook computers made for 64-bit processing is at least 12 months off, most experts say. Once 64-bit computers begin appearing with some regularity, experts say it could take anywhere from another several months to a few years for software to appear that's made to take advantage of 64-bit computing.

As long as the average desktop computer user is happy with the performance of his basic, 32-bit machine, the widespread appearance of 64-bit hardware and software will be a slow process. Right now, few applications can push the limitations of the 32-bit machine for the average user. Sending and receiving email, surfing the Web, and running Quicken don't exactly tax a computer to its limits. However, increased demand for improved video and audio streaming, more realistic gaming, voice-recognition software, and improved video editing and playback should drive the migration to 64-bit computing for consumers . . . eventually.

Is that fair for the rest of us who enjoy above-average computing power? No. But we survived the slow migration from 16-bit to 32-bit computing several years ago, and we can survive this migration, too. However, now that the seed for 64-bit computing is firmly planted, don't expect us to look at a 32-bit computer the same way ever again. **CPU**

by Kyle Schurman





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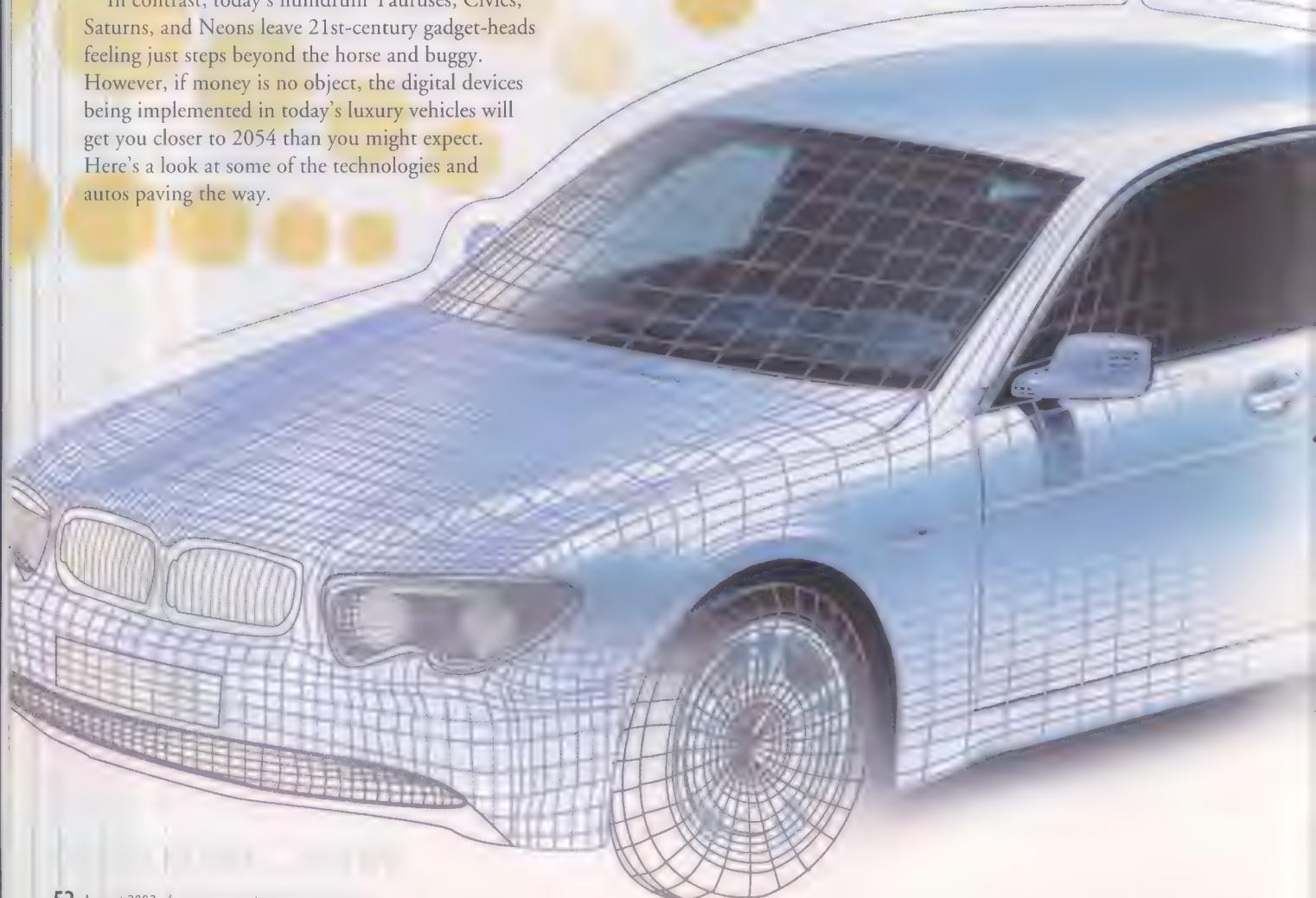


SMART CARS

The Technologies That Will Change The Way You Drive

One viewing of Spielberg's "Minority Report" will make you forget every Jetsons-based automotive cliche you've held dear. Cars won't fly in the year 2054; they'll magnetically float. Forget videophone screens because heads-up holography is en route. Seats will massage and conform to your body. Interior designs are dynamically coded to user preferences. Entry and ignition systems are based on recognizing the driver's DNA.

In contrast, today's humdrum Tauruses, Civics, Satrns, and Neons leave 21st-century gadget-heads feeling just steps beyond the horse and buggy. However, if money is no object, the digital devices being implemented in today's luxury vehicles will get you closer to 2054 than you might expect. Here's a look at some of the technologies and autos paving the way.



BMW 745i: The iDrive Feeling

The BMW 745i (www.bmw.com) is arguably the most computerized ride to roll off a factory line yet. Powered sun blinds accent the rear doors, there's an integrated hands-free cell phone, and the Harman-designed sound package places twin subwoofers under the front seats; the rear bench acts as an echo chamber. However, the main innovation is the iDrive.

iDrive is a haptic (force-feedback) system designed by Immersion (www.immersion.com), which also fuels Logitech's line of bumping, jittering peripherals. iDrive controls more than 700 functions in the vehicle. The iDrive knob between the front seats twists, depresses, and moves laterally, coordinating with an LCD mounted in the dash's high-center, acting like a souped-up mouse, with tiny motors simulating different feels. For example, twisting through the cell phone's contacts may feel stiff and clicky, while adjusting the car's fan blower speed may feel smooth. The aim is to get a feel for the setting rather than use visual feedback. Steven Vassallo, Immersion's senior director of mechanical engineering, says a unified control interface means less confusion and distraction.

Some complain the iDrive knob requires a hand to be off the wheel. Immersion is testing a similar, smaller product for Nissan (www.nissanddriven.com) that Vassallo describes as a haptic scroll wheel mounted on the steering wheel. He says nearly every automaker has approached Immersion about its haptic technologies. Although BMW couldn't confirm this for us, Vassallo says, "BMW just announced that iDrive would be in the next 5, 3, and 1 series."

Eliminating the key is another innovation. Touch the door handle and the vehicle communicates wirelessly with an electronic key chain fob. If the fob's digital signature matches the vehicle, the car unlocks. A Start/Stop button then starts the engine.

Cadillac Escalade EXT: Reloaded With Satellite Data

The EXT (www.cadillac.com), a 2003 SUV featured in the upcoming "Matrix" sequel, is one of the most data-savvy rigs on the road. It's one of few with OnStar (www.onstar.com) and XM Satellite Radio (www.xmradio.com) as standard equipment.

OnStar is the leading name in telematics services. Telematics is a field that focuses on enhanced safety and security features. If your airbag deploys, the vehicle's built-in analog cell phone (analog still has wider geographic coverage) instantly notifies a call center. A rep will try to contact the driver. If there's no response, coordinates from the car's integrated GPS are dispatched to an emergency rescue crew.

If you lock your keys in the vehicle, the call center can remotely unlock the doors. A hands-free cell phone with a stronger antenna than what's in your handset is already integrated in your vehicle. If someone steals the car, the telematics provider can relay vehicle GPS data to police. Live operators can perform the same job as DVD-based navigation software now appearing in other systems to help direct you.

OnStar's Virtual Advisor uses the cellular connection to download personalized data, such as stock quotes, news, and horoscopes. Text-to-speech technology can read email to you, although there's no way to reply from the vehicle yet. Telematics packages range from roughly \$200 to \$700 per year. Many features, including concierge services where live attendants procure items for you, cost extra.

XM Satellite Radio is the first automotive satellite radio product to reach the market, offering 100 music channels nationwide. It ditches DJs and commercials, but satellite-based music on its own probably isn't a viable long-term business. According to GartnerG2 lead automotive analyst Thilo Koslowski, "XM has about 60,000 people who have signed up, but they need about 4 million to break even." Koslowski feels the service may fly when high-speed data services are offered over the same satellite link and bundled with other automotive services.

Cadillac's EXT isn't all about communications. The utility/pickup hybrid has a wide-screen LCD and DVD entertainment system, three sets of A/V jacks, dynamically adjusting seatbelt tension, and a curb feature where mirrors automatically tilt down to aid in parallel parking.

Lexus LS 430: Sensing Luxury

Lexus (www.lexus.com) states that with 36 embedded computers and 53 sensors, the LS 430's processing power is equivalent

Redmond On The Road

In 1998, Microsoft (www.microsoft.com) and Clarion (www.clarion.com) unveiled the AutoPC, a Windows CE-based head unit with a 200-word speech recognition vocabulary, 256 x 64 TFT display, 64MHz CPU, and infrared and flash memory ports for swapping data with the user's PDA. The system sold for \$1,299 before GPS, navigation, and data service add-ons. Low sales brought the AutoPC to a screeching halt.

Today, Microsoft's Windows CE for Automotive is in version 3.5 and works hand-in-glove with Microsoft's Car.NET architecture. Where AutoPC tried to re-create a Windows experience in the dashboard, Car.NET is about providing a platform for third-party developers. In 1998, the story was about delivering professional services; it's now about the SUV and minivan crowds. That means backseat entertainment.

"Car.NET incorporates a number of core infrastructure .NET XML Web Services," says Gonzalo Bustillos, Microsoft's emerging technologies group director of business development. "There is Passport for authentication, My Services.NET for end-user data management, MapPoint.NET for navigation and routing services, and many more available in the near future. Presently, Windows CE for Automotive 3.5 is a telematics software platform that provides developers with the building blocks to quickly and reliably create powerful in-vehicle computing devices. This open platform showcases enhancements in key areas, such as hands-free, eyes-free communications; better speech recognition; safety; Internet access; faster startup times; cost-efficiency; flexible developer tools; and faster, more robust graphics capabilities."

Microsoft is mum on when we can expect these latest CE innovations. We do know that the interface should be much more intuitive and the system more interoperable with outside devices. Bustillos says, "the next version of Windows CE for Automotive will support 802.11, 802.1x, Bluetooth, CDPD, CDMA, and GPRS natively."

In 1998, cutting-edge concepts were about replicating the desktop in the car. Thilo Koslowski, GartnerG2's lead auto analyst, says this approach is bound to fail now. "Just bringing the PC into the vehicle is not going to work. Consumers use a vehicle to get from point A to point B... The idea of pushing down content from the Internet into the vehicle is just something consumers just aren't interested in paying for." ▲

to four modern PCs, "except these don't crash." The 430 is the first U.S. vehicle to use lidar (light detection and ranging) for Adaptive Cruise Control. A laser scans the road ahead of the vehicle. When you get too close to another car, the system adjusts the throttle, gearshift, and brakes for a safer distance. Mercedes-Benz (www.mercedes.com) uses a similar "distronic adaptive cruise control" radar technology in its S-Class sedans and CL-Class coupes.

The LS 430's throttle now features sensors and wiring instead of a mechanical link between the pedal and throttle valves. This "throttle-by-wire" technology, which BMW pioneered in 1987, has spread across most high-end autos, enabling such improvements as computer-controlled acceleration smoothing.

"Drive-by-wire" collectively used to mean wire replacement for the throttle, braking, and steering systems. Eliminating these bulky, costly, electro-hydraulic devices with wires and motor actuators frees designers to do amazing things. For example, the steering wheel might be passed between the front seats.

(In January, GM [www.gm.com] previewed its AUTOnomy "skateboard"

design. It's essentially four wheels mounted on a flat platform with wheel motors, fuel cell, hydrogen tank, and more. [Fuel cells burn hydrogen instead of gas and are expected to be the primary power method for commuter vehicles in the next decade.] Alternate bodies drop on the platform, PnP-like. You might use a two-door sedan chassis for commuting but use a minivan chassis for weekends. GM expects a drivable prototype by year's end.)

Rather than try haptics in the LS 430, Lexus opted for limited voice-command recognition and touch-screen technology in the dash's 7-inch LCD. A smart climate control system uses sensors and AI processing to sense, for example, the sun striking the vehicle's side. The system automatically redirects air blowers to that area.

Sonar sensors in both bumpers use beeps to indicate how close you are to nearby objects. The closer you get, the closer the beeps. At 10 inches, the beeps are continuous. Perhaps the 430's most significant technology is an intelligent skid-control and braking system.

"Skid control looks at the yaw of the vehicle, whether it's over-steering or under-steering vs. the steering input

angle," says John Weiner, Lexus' national product planning manager. "In such a case, the first thing it does is close the throttle to cut off the power. Then it applies one or more of the brakes to bring the car back in line."

Volvo Safety Concept Car: Just Around The Corner

Ford Research (www.fordvehicles.com) is heavily involved in various next-gen technologies. Many appear in the Volvo Safety Concept Car. Expect many of these innovations in Volvos, Lincolns, Jaguars, and other Ford brands soon.

One feature is thermal imaging for night vision displays. Infrared beams scan ahead, beyond the headlights' reach. IR images display on a digital cluster console, which is one big LCD display that shows indicators as graphics.

"The reconfigurable display cluster allows you to dynamically pick your instrument cluster layout," says Ron Miller, staff technical specialist at Ford Research Laboratory. "Your speedometer and all your gauges, the background, the size of the displays, everything can be personalized for you either from the

Our Favorite Cinematic Cars

Aston Martin DB5

The Aston Martin DB5 is arguably the greatest Bond car of all. It saved 007's life in 1964's "Goldfinger" and in 1965's "Thunderball." The DB5 also appeared in 1995's "Goldeneye." This rolling femme fatale magnet sported revolving license plates, a passenger ejector seat, a rear-spurting oil slick, retractable tire shredders in the wheel hubs, a machine gun under the hood, and, of course, bullet-proof glass. Sadly, the original Bond DB5 was stolen from an airport hangar in June 1997.



Batmobile

When George Barris customized the Batmobile in 1966 from a 1955 Lincoln Futura, it featured a turbine blower, chain cutter, flashing lights, and red mobile phone. The steel-bodied, 23-foot long black bomber weighed 3 tons—Holy Toledo! Completely reborn in 1989 for the "Batman" and "Batman Returns" films, the BM featured a smokescreen, oil slick, retractable armor plating, dual machine guns, grappling hooks, voice control, and a "Batmissile" mode, where the central fuselage and pulled-in wheels remain but the rest of the vehicle falls away. According to the 1989 designers, the vehicle traveled faster in reverse than forward in tests.



dealer or from a Web site you can download from."

Today's Cadillac DeVille has night vision, but images project to the windshield using a heads-up display. This mirror-based technology makes computer-generated graphics appear to float in the driver's field of view below his area of concentration.

Volvo's concept car also has rearward-facing cameras in the door mirrors. When you signal to change lanes, the cameras flash a video stream on your digital cluster showing the view of your blind spot. From the driver's seat, there's no more blind spot due to Plexiglas windows set into the A-post pillars holding the windshield. A forward-facing camera watches the driver's position in the lane. If the driver starts to veer outside the lane without signaling, a warning sounds.

Ken Hopkins, marketing director for Motorola Automotive (www.motorola.com/automotive), says camera systems can integrate with intelligent software systems to watch what's going on all around the vehicle. "As you start to switch lanes, it would identify and let you know whether or not that's a good choice."

Many vendors feel before long people will dock their cars instead of park them in garages. Wireless LAN technologies will let cars talk with PDAs, cell phones, and home network servers. A hands-free system will pull phone numbers from your handset and scroll through email from your PDA. Wireless gets really exciting, though, when your car can start communicating with the world around it.

"If you have children, you're aware of the value of a backseat DVD and television," says Dax Craig, vice president of business development for Centurion Wireless Technologies (www.centurionwireless.com). "Well, that will migrate to a system where you can download movies while you're pumping gas over an 802.11 network. . . ."

Although we can see short-range wireless leading to in-dash billboard pop-ups, designers might as easily, for example, design systems where your car could collect promos from nearby broadcasting restaurants or let cars automatically pass data to promote safety.

"I want vehicles to have the ability to know what's coming down the road," says

Motorola's Hopkins. "If there's an oncoming car in the other lane, it knows what I'm about to see over the next X number of minutes or miles. It could communicate to me what to expect—road conditions, traffic conditions."

Hopkins anticipates such wireless functionality should arrive in 2005 or 2006, but vendors are already sourcing these model years.

Shut Up & Drive

Drive-by-wire systems will inevitably enable tiny vehicles that are controlled by joystick (it's already happening with aircraft). Most experts we interviewed feel this is a bad idea. Nevertheless, automated highway systems such as those in "Minority Report" will be safer. Whatever happens, there's no question that the first 100 years of auto development will pale in comparison to that in the next century. **CPU**

by William Van Winkle

(To read more about notable events in automotive technology, see our Transportation Timeline at www.smartcomputing.com/cpumag/aug02/history).



Aston Martin V12 Vanquish

Aston Martin returns in the forthcoming 20th James Bond installment, "Die Another Day." Although MGM has sworn Aston Martin to secrecy about the V12 Vanquish's spectacular enhancements, we do know the V12 can top 190mph with its 6.0-liter, 460-horsepower engine. The car can accelerate from 0 to 60 in less than 4.5 seconds. A drive-by-wire throttle system and fingertip-controlled Formula 1-style paddles enable gear changes in less than 250ms. Aston Martin plans to only offer 300 units annually outside of the United Kingdom.

"Minority Report" Lexus

When Steven Spielberg wanted help visualizing future automobile travel for "Minority Report," he only had to look out his front window. "I've been driving a Lexus SUV," says the director in a release. "And I thought Lexus might be interested in holding hands with us and going into a speculative future to see what the transportation systems and cars would look like on our highways in 50 years. The result of that exploration is something that elevates and transforms driving into an environmental experience." Aside from the MAG-LEV system and heads-up display, the vehicle is essentially its own garage, docking to a building and sliding open its doors to become an instant add-on space to a conjoined apartment. While parked, the Lexus performs self-maintenance and recharges.



THE ULTIMATE DRIVING TECHNOLOGY

BMW's iOpener

BMW has long claimed its cars are the "Ultimate Driving Machines," and the company's latest 7 Series brooks no argument. Name a feature, and these cars likely have it. But for those who love technology, all of the most exciting features are sitting under the sheet metal, tucked away where nobody can see them.

To say that a lot of computing technology lurks under the car's hood is an understatement. More than 70 individual control modules are scattered throughout the car, controlling and monitoring everything from the variable valve timing and digital electronics to the park distance control and windshield wipers. Because several switches or functions can be assigned to any given control module, things become even more complex. Even in places where you'd expect to see a mechanical linkage, such as the gear selector lever or the parking brake, everything is controlled electronically. Doing so cuts down on weight, noise, and

mechanical complexity but requires some serious computing power to manage.

Bus Systems

Using dozens of control units and sensors isn't much of an engineering feat in and of itself, but the 7 Series sets itself apart by linking those devices together with six individual but interconnected main networks (BMW calls them bus systems) along with six smaller subnetworks that feed into individual modules of the larger network. The setup is far from simple, as each network has its own topology, data transmission rate, protocols, and other features that must operate together within each distinct segment of the network, as well as across the entire system.

These communications problems are solved through the use of gateway modules that are strategically positioned to intercept and route all traffic coming through the network. The gateways modify the speed of

a transmission so it is compatible with the segment of the network it is heading toward and also can combine several messages or store nonpriority messages in buffer memory to be sent or acted on when network traffic settles down or another component calls for the data.

At first blush, this system seems to add several unnecessary layers of complexity, but in practice, it allows for an unprecedented level of interactivity between components, letting the car perform all manner of advanced tricks. The fuel pump control, for example, can read data from several other modules located throughout the network and make educated decisions based on that information, all without having dozens of separate wires converging on it. A simple example BMW provided is the sequence that happens when the driver flips on the car's windshield wipers. (Note that abbreviations used throughout this article may seem a little odd, as BMW bases them on the original German names for components, not their English equivalents.)

In a standard vehicle, the driver literally turns a switch on the wiper motor telling it what speed to use. Not so with the 7 Series. Instead, the movement of the windshield wiper switch is sent to the Steering Column Switch Center Module located within the "byteflight" system bus. The input message then travels to the byteflight bus' central SIM (Safety Information Module), a hub that collects, interprets, and passes along data from 11 safety-related control modules.

K-CAN-S (Body Control Area Network System):
Minimum Data Rate: 500Kbps
Network Topology: Linear

The two CAN networks in the 7 Series actually operate much slower than the 500Kbps CAN found in older models, but now that the former workload is divided among several proprietary networks, speed and bandwidth are no longer pressing concerns. Dividing the one CAN into two also was done for redundancy purposes, so that in the event of a crash, one half should remain functional even if the other is damaged or destroyed.

Although the System bus handles traffic for 14 separate control units, it can accommodate as many as 40, so BMW can easily develop and release mods and upgrades for the existing car or add new features to future models without redesigning the entire bus system. In the 2002 7 Series, the K-CAN System bus handles the flow of data coming from modules such as the infrared rain sensor, the sunroof controls, the ultrasonic park distance sensor, and the air-conditioning units.

Two sub-buses connect to the K-CAN-S. The air-conditioning motor bus sends data from the car's multitude of air conditioning units to the Automatic Integrated Heating and Cooling System module, while the DWA K-Bus (Alarm System Body Bus) lets a siren/tilt sensor interact directly with the DWA (Antitheft Alarm System bus).

D-Bus (Diagnostic Bus):
Maximum Data Rate: 115Kbps
Network Topology: Linear

The D-Bus migrated over from the previous incarnation of the 7 Series, with some major improvements added during the transition. Although the old bus ran at 9.6Kbps, the updated variant sails along at 115Kbps. The bus is designed to let mechanics and engineers easily diagnose electrical and mechanical problems with the system, providing access to every module on the car from a single access point. The D-Bus has no modules attached and serves only as a conduit between the car and the diagnosis tools technicians use.

The SIM routes the message through the byteflight bus to the Central Gateway Module, which serves as a message clearinghouse for the entire network. The module sees that the message is destined for the Wiper Module connected to the separate K-CAN-S (Body Control Area Network-System) bus and translates the

message into data that the slower bus can understand before passing it along. The message then goes through the K-CAN-S bus directly to the Wiper Module because that bus uses a linear network topology and doesn't have a central hub. Finally, after traveling across two separate bus systems and through a gateway, the Wiper

Module interprets the message, and the wipers start up.

Each part of the network is expanded and explained below so you can get a better picture of how the system works. See www.smartcomputing.com/cpumag/aug02/cars to see the actual layout of the 7 Series' networks.

Byteflight Safety Systems Bus
Maximum Data Rate: 10Mbps
Network Topology: Star

The 7 Series' other fiber-optic system bus also has a unique topology, with connected modules arranged in a star pattern. Byteflight is a protocol designed to handle the car's ISIS (Intelligent Safety Integration System) and was developed in conjunction with several other companies, including Motorola, Infineon AG, and Elmos AG. The protocol is designed to give messages on the bus high priority and handle synchronous and asynchronous data. The byteflight bus in the 7 Series uses a powerful Safety Information Module to monitor and route all traffic coming from the 11 other modules connected to it. The fiber-optic connections ensure plenty of bandwidth is available for the important data flowing across the byteflight bus, including all the information coming from and going to sensors that control airbag deployment.

MOST (Media-Oriented System Transport)
Maximum Data Rate: 22.5Mbps
Network Topology: Ring

Of all the bus systems contained in the 7 Series, MOST is arguably the most fascinating. It is the faster of the two new fiber-optic bus systems, operating at 22.5Mbps, and is also the only system bus in the entire network to use a ring topology. Data traveling across the bus follows a predetermined route, flowing from Control Display module through eight other modules before ending up at the Instrument Cluster module. Along the way, it hits every entertainment and navigation control unit in the car, each sending specially packaged messages to be "unwrapped" and interpreted by the next module in the circle. Messages from the Compact Disc Changer, for example, are added to messages from the Antenna Amplifier Tuner module (handling radio signals and amplification), which in turn are soaked up by the LOGIC7 stereo module that comes next in the chain, where they are processed and output over the car's speakers.

Messages passing across the MOST bus consist of control data, asynchronous data, and synchronous data, with each getting its own portion of the total bandwidth. The control data, which sends commands to the various modules on the bus, gets only a narrow 700Kbps slice of the bandwidth. Regardless, that represents a potential 2,700 messages per second. Asynchronous data, such as navigation information, and synchronous data, such as audio and video signals, split the remaining bandwidth.

MOST has one sub-bus, the TelCOMM CAN phone board bus, which connects directly to the Telephone Control Unit module.

K-CAN-P (Body Control Area Network Periphery)
Maximum Data Rate: 100Mbps
Network Topology: Linear

The K-CAN Periphery bus intercepts and outputs commands related to relatively unimportant things, such as the hydraulic trunk lid lift, but is also attached to some essential new control units such as the Power Module and CAS (Car Access System). The Power Module is a relatively complex piece of hardware even for this car, handling all of the electrical distribution, electrical fuses, battery charging, and related tasks. When shorts or other faults are detected in the car's electrical system, the Power Module can individually turn off any component or group of components while still making sure the car's critical systems receive power. In other words, if the power gets down to a critical level, the module cuts off the entertainment system so the engine computers get plenty of juice.

The CAS covers all aspects of ignition, vehicle immobilization for the security system, and the central locking system for the doors and windows, along with serving as a gateway between the K-CAN-S and K-CAN-P. The unit is designed to interact with the 7 Series' electronic key, which transmits a unique security code that a transponder in the CAS picks up. If the code is legit, the CAS fires up the engine when the driver presses the Start button. If not, the Start button is effectively cut off from the rest of the system.

A sub-bus called the P-bus (Periphery bus) is attached to the K-CAN-P that lets the Drivers Door Switch Block (containing such things as the window controls and sun shade controls) communicate with the driver's side door module.

PT-CAN (Power Train Control Area Network)
Maximum Data Rate: 500Mbps
Network Topology: Linear

Every control unit and other module that has anything to do with the car's power train are connected linearly to the PT-CAN bus. This includes the antiroll and other automatic suspension stabilization units and the digital motor electronics. Because these sensors and systems constantly generate so much traffic when the car is in motion, the PT-CAN has five times the bandwidth of the car's other CANs to handle all the data.

Two sub-bus systems are also connected to the PT-CAN. The LoCAN (Engine Low CAN bus) lets the Valvetronic variable valve-timing module communicate with the DME (Digital Motor Electronics) module, while the BSD (bit-serial interface bus) lets the battery control module and oil quality sensor talk to the DME.

Fiber-Optics: The Choice Is Clear

The latest audio, video, and navigation systems require some serious bandwidth. Engineers at BMW outfitted the 7 Series with two all-new, fiber-optic networks to meet those demands. The benefits of fiber-optic technology are legion. It supports relatively fast data transfer rates and is immune to EMF interference (and doesn't radiate its own EMF). And the plastic cables used in the 7 Series are far cheaper and sturdier than previous glass designs. Like any technology, fiber-optic networks are not without their weaknesses. Cables can't be bent to a radius smaller than 50mm, and the inside core cracks or shatters when the cable is crimped or stretched. The ends of the cable must be kept perfectly clean or much light is lost through attenuation, which also becomes a problem if the wires get too long or the light signal must pass through too many relays. For these and other reasons,

standard copper wiring is also used throughout the car, with fiber-optic cables reserved for the most broadband-hungry portions of the network, such as the entertainment and navigation control units.

Although the MOST system bus in the 2002 7 Series operates at 22.5Mbps, technical documentation BMW provided suggests subsequent generations of the technology will operate at up to 150Mbps, which will let more users separately but simultaneously interact with more entertainment and navigation equipment. Considering that BMW reports that a decent-quality video signal for a DVD movie consumes 11Mbps of data all on its own, the extra bandwidth will be a welcome addition to upcoming vehicles.

Regardless of what each control unit on the MOST bus does, they all come with standard equipment for handling optical data. Each module has a network interface containing an optical receiver, a MOST transceiver that converts the optical data into digital data and

vice versa, and an optical transmitter. The entire interface is controlled by a microprocessor with special NetServices networking drivers.

If you thought the throttle was complicated, pressing the brake pedal sends even more computers into overdrive. The speedometer, wheel sensors, rotation (yaw) sensor, and many other control units collaborate each time the brake is applied to give individual attention to each wheel. Meanwhile, sensors track brake wear to let you know when you need new pads, and another control unit intensifies tail light brightness when it senses a driver putting a lot of pressure on the brakes. **CPU**

by Tracy Baker

See www.smartcomputing.com/cpumag/aug02/cars for information about computer technologies from other car manufacturers and Microsoft's Windows CE for Automotive initiative.

iDrive In Control

Depending on how many options you want when placing an order for a 745i, the car can come with as many as 700 user-selectable functions. Putting buttons and knobs in the dash to control all those features would have made the car look more fit for Star Wars than luxury transportation, so BMW's engineers spent years developing a system that would let users harness all the car's features without taking away control or diverting attention from the road. The result is iDrive, a command and control system computer geeks will love.

The main interface for the iDrive system is a round metal hat switch at the front and center of the center console. Menus and other visual data are output on a relatively large color LCD located just beneath the lip of the dash, so drivers don't have to take their eyes completely off the road to see it.

Making menu selections is easy, if a little unintuitive. Flick the switch in one of eight directions to access one of the eight main menus (including navigation, communication, entertainment, and climate controls), then rotate it to highlight entries in the submenus. Once the option you want is highlighted, push down on the switch to select it. Except in special circumstances, you can reach the eight primary menus no matter what submenu you have burrowed down to by moving the stick in the proper direction. Oft-used controls such as audio volume and some air conditioning settings still get their own dedicated knobs, but you can access and fine-tune them from the iDrive, as well.

The iDrive switch is programmable and entirely context-sensitive. Technology supplied by Immersion gives the iDrive controller the



Use the iDrive knob (left) to navigate eight main menus, adjusting hundreds of controls. The menus appear on the below-dash LCD (right).

same force-feedback capabilities computer joystick, gamepad, and mouse users have enjoyed for years. The force feedback changes the iDrive controller's behavior relative to the menu you are navigating, clicking into place each time you reach a new menu entry and refusing to turn once you have reached the end of the menu. It acts differently in the navigation menu, where the force-feedback is used to indicate various zoom levels on the map.

In the time we spent testing the iDrive, it was easy to see why the system has some detractors. Navigating the menus is fairly unintuitive: We kept feeling compelled to push the stick to select menu items instead of rotating it. Once we'd dug deep into any submenus, it was difficult to tell which direction to push the stick to access a different main menu and frustrating to instantly be transported to a different main menu when we nudged the stick accidentally. Operating something as complex as the iDrive is difficult enough for beginners when the car is sitting still; it would take plenty of practice to get familiar enough with the system to access all its functions while driving. Regardless, it's tough to imagine a more elegant way of navigating all those menus and submenus short of doing it entirely with speech, and that technology is still a ways off.

The 745i: A Peek Inside

Steering Wheel

For cars equipped with Steptronic manumatic transmissions, the two buttons at the top of the wheel are used for upshifts. Similar buttons on the back control downshifts. A driver holds the voice-activation button at the top of the left column of buttons to "talk" to the car.

Headlight Switch

Even the headlights are affected by computers: They automatically keep the lights pointed straight ahead based on fluctuations in cargo and passenger loads.



Parking Brake Button

The 7 Series' parking brake is fully electronic: Push this button or put the car in Park, and it engages automatically.

Gear Selector

No mechanical parts link this gear selector to the six-speed automatic transmission. Cool feature: Put the car in Park at a stoplight, then hit the gas when it turns green to go without having to shift again.

Engine Start Button

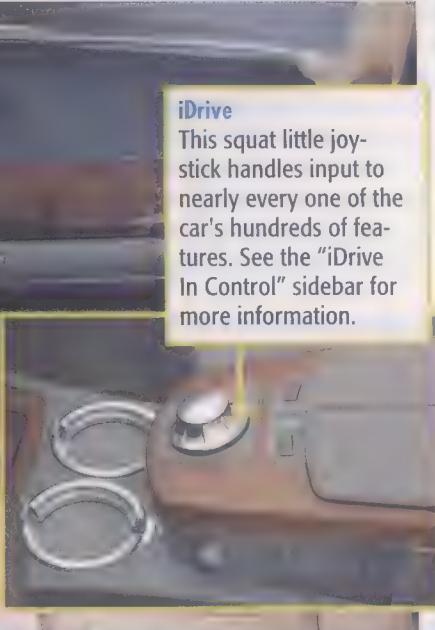
You have to insert an electronic key to let the engine know you have a right to be in the driver's seat, but you get to press this button to start it up.

AC & Radio Controls

The iDrive handles nearly every feature in the car, but traditional volume, tuning, and air conditioning controls are provided for these frequently-accessed settings.

iDrive

This squat little joystick handles input to nearly every one of the car's hundreds of features. See the "iDrive In Control" sidebar for more information.



Instrument Cluster

Instrument lighting brightens and dims automatically, depending on the amount of ambient light a control unit senses. A programmable cruise control shows presets using illuminated arrows on the speedometer.



Air Bag

This driver's side airbag is wired to the car's ISIS (Intelligent Safety and Information System) network, which monitors 14 sensors for information on what safety features to deploy in a crash. With knee airbags, optional side airbags, and optional active head protection systems to track, as well, it requires plenty of computing power to take the guesswork out of safety.

Foot Pedals

That's not a gas pedal; it's a drive-by-wire throttle. Press it, and several computers spring to life, precisely controlling fuel injection, air intake, valve timing, and about a million other variables to apply a precise amount of power to each individual tire.

If you thought the throttle was complicated, pressing the brake pedal sends even more computers into overdrive. The speedometer, wheel sensors, rotation (yaw) sensor, and many other control units collaborate each time the brake is applied to give individual attention to each wheel. Meanwhile, sensors track brake wear to let you know when you need new pads, and another control unit intensifies tail light brightness when it senses a driver putting a lot of pressure on the brakes.

LEAR UP YOUR ROD

Technology for Your Car

Smart Cars. No, we mean *really* smart cars. We're talking about cars responding to voice commands, cars that talk back with directions to your next destination or even to your favorite burrito shack. We're talking about cars that have large dashboard LCDs on which you can monitor your progress according to a satellite that is in geosynchronous orbit miles above. We are talking about keeping your contact info on your key chain, about having more MP3s in your car than on your PC. Smart? These cars are brilliant.

In the past, tech-ed-up cars have been the playthings of affluent but balding males nursing a midlife crisis or British operatives with a license to kill. In recent years, the technological revolution has invaded the front seat, however, and with it come cutting-edge gadgetry for your rod that is surprisingly affordable yet no less cool. As you will see in our overview of new and upcoming auto toys, the line between your dashboard and a full-blown PC is about to blur.

Data To Go

Every true PC addict misses his or her desktop rig when on the road. Someday, of course, and that day may come sooner rather than later, getting vital information from your PC or the Web while driving will be no harder than popping on the AC. Until then, we'll call some of these portable data tools an interim technology, toys to tide us over until our cars become as informative and chatty as a "Star Trek" computer.

DIY Voicedex CarKit

\$279

www.hotech.com.tw



Just coming to our shores from Taiwan manufacturer HOTECH, the DIY Voicedex CarKit combines voice recognition with hands-free cell phone use and even lets you control other car cockpit functions with a simple spoken command. At the heart of the system is the Voicedex device, a palm-sized voice phone book. In or out of the car, you can speak as many as 60 names and numbers into this device. It learns your vocal patterns so that it can recognize a contact's name (even nickname) when you ask for it later. The Voicedex will then not only recite the full contact information, but will also dial for you via a cell or home phone. Attach this to the CarKit add-on, and you have hands-free calling and more. It connects the phone output to your stereo system, eliminating the need for a headset. The voice recognition system can also be tied to other car functions: You can program vocal commands for changing volume or pausing a CD/tape player. Now if only voice commands could work as easily on noisy backseat kids and know-it-all navigators in the passenger seat.

Digital Music: Rip It, Rock It, Beam It In

If you're still wondering whether to get a CD player for your jalopy, catch up, Dilbert. Detroit is way beyond CDs as it starts rolling out full-blown home entertainment suites for the car. With MP3s, satellite radio, and DVDs, your next car could be a better home theater than your living room.

Sony tries to split the difference between a CD player with MP3 support and a car MP3 jukebox with this combo audio unit that can record your CDs.

The MEX-HD1 combines a receiver and CD player with a 10GB internal hard drive. Pop in a CD, and you can compress and record any or all tracks at up to 8X CD speeds, even when the car is off. The library should hold as many as 165 hours of music. Like all contemporary Sony units, this one also has a Memory Stick socket so it can transfer recorded tracks for use on a portable player or even transfer back to your PC or PDA.



MEX-HD1

\$1,500

www.sony.com

Magic-I Key Chain

\$20

www.mymagic-i.com



Forget bulging pockets, belt holsters, and losing your stylus: This diminutive key chain PDA may be all a traveler needs, and it is an amazing bargain at \$20 from many ecommerce outlets. The "I" in the Magic-I Key Chain is an eye on the back of this unit that actually reads your contact information from a PC screen. The device can hold as many as 120 contacts, albeit with a maximum of 10 characters per name, along with phone numbers and birthdays. You can input this information directly by using a twisting control that lets you cycle through letters on the LCD. The cooler way is to put your contact info into the downloadable software on your PC and then (no kidding here) hang the Magic-I from a stick-on holder that is attached to your monitor. An on-screen box flashes, while the Magic-I's "eye" reads and translates the data into contact info. It even carries event reminders that pop up when you start the PDA.

OK, it sounds a bit more cumbersome than cool, but at \$20 or even \$30 in Canada, who wants to argue with having the most vital on-the-go info dangling from your key chain rather than from a costly device digging into your intestinal area from your belt?

Why fiddle with CDs at all when you can slip a hard drive into your car audio system and play up to 2,000 CDs of music in MP3 format exactly as you would on your PC's media software? Available with multiple hard drive sizes and connectivity options, the Neo Car Jukebox from SSI America downloads files from your PC, rests comfortably within an in-car mount, and then plays and plays and plays.

The Neo maintains docking bays at your PC, which remains connected to the computer, and one in the car, which is tied to the audio system. The jukebox itself then slips in and out of both bays for data transfers at the PC and playback through your car audio system, without having to muss with any reconnections after the initial installation. A credit card-sized wired remote operates the device, which can play standard audio playlists, randomize and repeat tracks, and apply equalizer effects. An IR remote, also included, lets you stow the jukebox in the trunk but control it from the car cab.

KTC-SR901

\$250

www.kenwoodusa.com



Much like interactive television, satellite radio is the gee-whiz technology everyone said they wanted . . . until it was available. The idea of having your audio music and information beamed directly from an orbiting satellite is starting to catch on, however, and units such as the Kenwood KTC-SR901 have all the bells and whistles needed to make the most of the cutting-edge technology. It can sync to any one of three satellites, so there is less chance of losing a signal. Along with many top

brand sat radios, the Kenwood tuner is designed to work with the Sirius audio service, which offers a subscription package of 60 music and 40 information stations for about \$13 a month.

After decades of enhancements and bells and whistles, what was left for electronics developers to put into a car audio system? A 32,000-color TFT display, of course. In yet another stab at bringing common PC functionality to the car, Sony gives your CD receiver deck visualization tools. A full-motion mode displays animated mood screens, including shooting stars and tumbling cubes. The real fun starts when you use the Memory Stick socket to upload personalized images. The TFT screen uses a standard mode to feature as many as 100 images as wallpapers and a panoramic mode for panning across oversized pictures.

The 2MB of on-board memory should store 100 JPEG files but also supports GIF, BMP, and even animated GIF formats. Perhaps it goes without saying given the hefty \$1,000 price, but Sony also supports standard audio, as well as MP3s, on CD-R/RW media. The Memory Stick is another route for playing up to 128MB of MP3s, as well.

Sony is distributing this first in Europe, and frankly, we're not sure Americans are ready for this. It should be hitting retail stores this summer, however. On our shores, a gadget like this could go one of two ways. It either is a cool add-on for passengers who want to groove to good music visualizations and clever images, or it could just be another venue for boring people with slide shows of a recent family trip.

MEX-5DI

\$1,000

www.sony.com



Talk To Your Car

Voice technology has had a hard time finding its niche in the PC, but Detroit is dead certain that we will embrace it while driving. As the number of gadgets on your dashboard proliferate, the risks of distracting drivers from the road escalate. Voice recognition and feedback may actually help make our roads safer.

With its Pentium MMX processor, the Joyride truly does pack a PC into the dashboard. This is the centerpiece of a voice-activated, modular entertainment and information hub from Clarion that also uses the MS CE OS. The Joyride promises total control of many of the next-gen functions we covered here, including watching DVDs on a backseat LCD and playing CD/FM/AM music and MP3s on a Compact Flash card. The Joyride also provides navigation, cell phone control, and local, real-time traffic reports.

Joyride
\$2,400 to \$2,800
www.autopc.com



Sure, most of us already talk to our cars ("Damn bucket of bolts!"), but how many of our rods listen . . . and talk back? Visteon's Voice Technology is a receiver/controller that sits on your steering wheel and sends commands throughout the vehicle. It recognizes more than 100 simple voice commands to adjust in-car audio, phone, door locks, windows, lighting, and temperature. This thing even recognizes six lan-

Voice Technology
Pricing Varies
www.visteon.com

guages (English, French, German, Spanish, Italian, and Japanese) and can adapt to nonstandard

dialects, which is more than we can say for ourselves, frankly. Voice Technology is standard in the 2002 model Infiniti Q45 and is coming to Jaguar S-Class cars soon.

Find Your Way

It's a male thing. Many of us would rather tie our cars to a low-orbiting satellite than actually ask directions, which is one reason why it's probably good that GPS is all the rage. This recent technology opens the door for yet another wave of gee-whiz hardware development for the car. Here are just a few of our favorite ways to get there faster.

TravelEyes2 not only tells you how to get where you need to go, but it even tells you where you've been. This is a boon to business travelers because it records the position of your vehicle every 10 to 20 seconds so you can download results to a computer later for a precise record of a car's routes taken, mileage, duration of stops, and even speed.

To use TravelEyes2, just plug one end into the cigarette lighter and put the antenna on the dashboard. TravelEyes2 also plugs directly into a notebook to provide real-time mapping of your progress toward a destination.

And let's not overlook the TravelEyes2's espionage potential. Even the manufacturer, Advanced Tracking Technologies, suggests that its product, which is small enough to be hidden in a car, can serve as a "kid tracker." And the company offers TravelEyes2 as a cheap alternative to a private investigator, calling it "a tool that could prove your suspicions are valid."



TravelEyes2
\$349
www.traveleyes.com

Imagine a passenger-side navigator that tells you to turn left at the next light but never nags or throws the map in your face in frustration. As an alternative to an irate spouse, the Garmin StreetPilot III may be worth the \$800 it will cost you. Sitting on the dashboard and linked to the a GPS satellite system, the StreetPilot III not only plots your present position and destination on a full-color map but even speaks . . . in calm, modulated tones, no less. The voice prompts give fair warning before the next turn and tell you whether you have strayed from the planned route and the remaining distance. The backlit LCD also has oversized labels and directional arrows that serve as a visual guide from the dashboard. The maps zoom down to such a level of detail that a 900-foot area can fill the 305- x 160-pixel screen.

The StreetPilot III can store as many as 50 sets of turn-by-turn directions. The unit handles 32MB and 128MB data cards. When connected to your PC, it can download detailed city maps to these cards. Need to get to a gas station, hospital, or just an ATM in a hurry? The menu-driven interface can lay those destinations onto a map at the touch of a button. Now Junior won't have to hold it until you get to Wally World.



StreetPilot III

\$799

www.garmin.com

The Big Cop In The Sky

The big downside of home, a video-link car is that it requires a driver to answer the surveillance. Luckily, the same technology that makes your automobile easy to monitor from 25 feet outside can also be used to track yourself when you had your little Timex at the passenger seat a car is never far in order to figure out how the last stop shop discontinued it into a thief and track your car's position without ever having to be seen.

If you're already paying for GPS or for a car that should be able to make a single remote stop, then why not the Video Car? Cost: \$1,275.00 to \$1,499.95 (www.videocar.com).



The Video Car recovery car retrieval system sends a radio signal from your car to a satellite relay which in turn connects the local police with the location of your vehicle.

Don't Leave Home Without Them

Some car gadgets are so novel that we haven't even created categories for them yet. These new toys not only keep your coffee hot, but may also ensure that your arrest record stays clean.

With VideoCar, you can make the most of your surveillance from the desktop. Set you car to receive commands to lock and unlock the doors on just about any of the stops below your garage.

Video Vehicle Recovery System, Video VRS, and many European firms including Deltek, Denss, and Parker Systems, among others, are the Video Vehicle Recovery Systems. Unlike GPS systems, the VRS offers an extra insurance, a "Safe Box" that's hidden. After you've more than 70 possible stops in the car, law enforcement officials can locate it on the spot when you're needed.

Most new programs let you log on to the road when any accident or emergency are made to drive it. You don't need to register to log in to order for the VRS to work. Which is perhaps the most popular implementation of the system, and it's easier to fit the rail car control system police department.

Why get another hunk of transistors just for satellite-directed mapping when you already have a PC in your pocket? TravRoute converts the major PocketPCs into GPS map readers by bundling software with an add-on card. Now your iPaq can tell you to turn left in 1.7 miles: The Pocket CoPilot uses the PPC's multimedia capabilities to deliver audio directions, in your choice of male or female voices. For drivers, the PDA screen gives oversized text directions and directional arrows in addition to voice prompts. A "passenger screen" helps human co-pilots with a full map that tracks the car's progress.

There's the usual assortment of GPS goodies: salvaging your route after unexpected detours, real-time estimated times of arrival, and such. But our favorite feature involves the suite's integration with PPC Outlook. The program will import and plot destinations directly from your contact list.

Different bundles are required for hardware compatibility with

Compaq, Casio, and HP models. TravRoute sells similar hardware/software packages that work with notebooks.



Pocket CoPilot
\$299 to \$349
www.travroute.com

This personal Breathalyzer is sort of a PDA for the one-too-many set. What would be an antenna on any other mobile device is the breathing tube on this one. Puff into it, and an illuminated LCD registers your BAC (blood alcohol content) from between .000% to .200%, which probably is the point at which you would be too stupefied to remember to use the thing in the first place.

When your BAC hits .050% or higher, the device beeps and issues an alert on the LCD. There is a 90-day warranty but no mention of standing up for you in court.

Driving Headlong into The Future

The Jetsons' car may have been able to fly, but other than that, it ain't got nothin' on what auto suppliers have planned. Most industry analysts predict that the really cool stuff will start emerging in 2003 as major electronics manufacturers start implementing their plans to turn your car into a moving PC. Phillips is introducing a series of semiconductors and chipsets called the Nexpria Car Infotainment Platform for third-party

developers. This architecture promises to connect your car to the Web for in-car email systems, site browsing, maps and directions, and real-time traffic reports. Phillips has already introduced a microprocessor designed to integrate DVD functionality in the car. It will drive movies in that format for passenger displays as well as DVD music and disc-based voice directions for the driver.

Meanwhile, cell phone giant Ericsson wants to use WAP to bring Web-driven data

NAV-SYS900DVD

\$3,300

www.pioneerelectronics.com



Yeah, this GPS system is going to cost you, but imagine getting a 3D view of your route to a destination. The Pioneer mega-system is based on its AVIC-90DVD package, which combines DVD storage with GPS positioning; voice recognition; a dedicated graphics processor; and a "3D hybrid" sensor, which knows whether you are driving uphill or downhill as well as east, west, north, or south.

The bundled DVD stores the dense mapping information. In addition to every detailed street map imaginable, the disc includes more than 900,000 specific listings for restaurants, hotels, and gas stations in the United States and Canada. When this packed DVD is combined with the satellite tracking that is also included, you have a system that can tell you in real-time how far you are from the nearest Burger King or Ramada, not that you would need either if you could afford a rig like this.

Not only does this unit deliver voice direction, but it also uses voice recognition. Tell it to "reroute," and it will develop an alternate route to the destination. Tell it to "return home," and it plots and delivers directions to get you back home from wherever you happen to be. And, yes, the NAV-SYS900DVD can play movie DVDs, as well. Naturally, the bundled color 6.5-inch LCD even comes in a wide screen aspect ratio.

Digital Alcohol Breath Tester

\$99

www.sharperimage.com



Smart Mug
\$29.95
www.giftsandgadgetsonline.com

To hell with geopositioning satellites, DVD mapping, and voice commands. When you get into your SUV in the morning, you just want a perfect cup of coffee. This tech-ed-up mug uses a digital thermostat to let you set the right temp for your cuppa joe. It plugs into the car cigarette lighter and can bring your cup up to a Starbucks-worthy 160 degrees or just keep the baby bottle warm. A digital display tracks the heating process and beeps when ready. The only downside we see is its capacity: 16 ounces. For coffeeholics like us, that is roughly equivalent to a quick shot.

access, faxes, videos, and music into car infotainment systems. Like many of the more elaborate plans for your rod, for some reason these will roll out in Europe before reaching our own shores, which may be a good thing, really. Not all of George Jetson's technology worked correctly right out of the box.

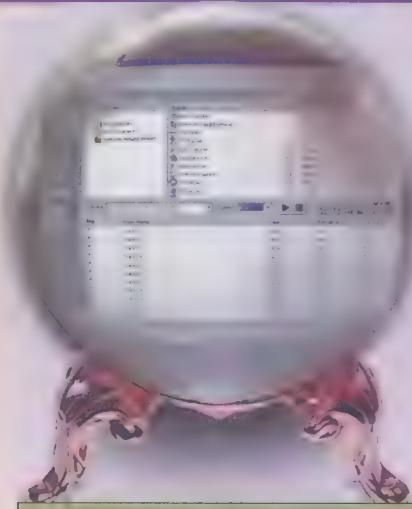
Remember "Jane, stop this crazy thing. Help, Jane . . . Jaaane"? **CPU**

by Steve Smith

The Bleeding Edge Of Software

by Warren Ernst

Inside The World Of Betas



Official product name: CD Ripper
Version # previewed: 0.7 BETA 3
Publisher: Green Point Software
Developer and URL: Green Point Software; www.gpsoftuk.com
ETA: Q3 2002
Why you should care: Quick and easy MP3 ripping at a good price.

Fortune-telling becomes an exact science when it comes to working with betas. This month we bring you four glimpses into the future of software.

CD Ripper 0.7 BETA 3

There simply can't be too many CD rippers—especially ones that work well, have useful features, a good interface, and a low price. These attributes describe CD Ripper 0.7 BETA 3 to a tee. Despite a few omissions in the beta, what's here works well and shows great promise.

CDR uses an Outlook-like interface with three panes. One displays frequently accessed commands, another lists folders on your computer, and another lists tracks of the current CD. To rip a CD, insert it in your drive, wait for the track list to appear, check the tracks you want, and let 'er rip. In my tests, ripping was slightly faster than MusicMatch Jukebox 6.

Unlike MusicMatch, CDR's options aren't buried within nested dialog boxes; most are front and center. As a result, it's reasonable to only enable "jitter correction" when a specific track needs it and to enable auto-normalize only when you're grabbing MP3s from a disc with different volume levels track to track. The other really useful feature is the straightforward conversion of MP3s to WAVs and vice versa.

There's no ignoring CDR's beta status. 0.7 BETA 3 is missing automatic CDDB track lookup and MP3 file naming, plus a Web update feature and Help file. These all are scheduled for the magic 1.0 version. Beta users who want it now can preregister for the final version for \$10, which is a good deal for a product like this.

WebLog Expert 1.51 beta 3

Looking at the raw log data that Web servers generate is about as confusing as a federal tax form. WebLog Expert is one of many Web server log analyzers that translate those thousands of lines into easily readable graphs, charts, and statistics. What sets WLE apart are its free and Pro (\$80) versions. Both generate attractive reports in HTML that look better than most of the competition's reports.

If you don't regularly scrutinize your logs, deciding between the versions is tough. The feature

list should help. Both versions support Apache and Microsoft IIS server logs and automatically detect the log format. Both can also automatically read Zip and gzip compressed logs; keep track of browser types, OSes, referring sites, URLs, and search engines; file-usage stats; and general file errors. The Pro version adds date and user/domain/IP address filters, more charts and graphs, and many little extras.

The best extra may be a command line interface. It

allows for automated log-file analysis using a scheduler. This can dump reports into your Web server's folder structure so you can then check your logs remotely via any Web browser. The Pro version also caches DNS lookups, so rerunning reports from the same (or similar) log files takes less time than the free version.

Both versions were fast, stable, and came with complete help files. The setup programs were straightforward, and the generated reports were elegant and compatible with Netscape, IE, and Opera. If you run a server, check it out.

Official product name: WebLog Expert
Version # previewed: 1.51 beta 3
Publisher: SerpikSoft
Developer and URL: SerpikSoft; www.serpik.com
ETA: Q2 2002
Why you should care: Great Web log analysis at a great price.

Universal Village Community 1.0 beta

Sometimes a beta is all about its potential. UVC 1.0 is an upcoming product that combines a digital personal organizer with an IM system with the goal of making online collaboration with team members and friends a snap. Despite its worthwhile goal, UVC is a bit too cumbersome for use right now for this purpose.

UVC is a large Java app that requires Sun 1.2 runtime libraries and Java Web Start. Mac OS X users have these built in, but Windows users will have some free downloads to install. Once you do, UVC works a bit like Palm Desktop. There's a to-do list; a Daytimer with daily, weekly, and monthly views; and an Address Book. The app can import vCard and other common export formats, so transferring personal data doesn't take all day. When it works, that is, which wasn't always the case for me. But that's what betas are for, right?

The app's fourth module is an IM, which is similar to an older version of ICQ without the extensive

searching feature. Once your IM list is populated with folks also using UVC, you can enjoy sharing address book entries and schedule meetings group-wide. Because this all runs on Java, the developers state that group members can do this anywhere there's a public Internet kiosk.

In practice, this isn't always the case. Most Windows-based kiosks won't let you install the necessary Java bits to get UVC up and running, and there aren't a lot of Mac OS X kiosks out there yet. Additionally, even on a relatively quick machine, UVC feels a little sluggish. In addition, the import feature didn't always work, and I wasn't about to re-enter 1,200 names from my Palm's address book.

There is potential here, and the app could work well for your group right now. But for most users, waiting for a later beta may be prudent.

Official product name: Universal Village Community
Version # previewed: 1.0 beta
Publisher: Universal Village
Developer and URL: Universal Village; www.uvc.ca
ETA: Q3 2002
Why you should care: Maybe the next big thing in group collaboration.



Official product name: Netscape 7.0
Version # previewed: 7.0 Preview Release 1
Publisher: Netscape
Developer and URL: Netscape; www.netscape.com
ETA: Q3 2003
Why you should care: A facelift for maybe the best browser going.

Send Us Your Betas

Know of software in the beta stage that's deserving of some attention? Let us know. We'll take a look at it and possibly give it a go-around. Send your prospects to bleedingedge@cpumag.com.

Netscape 7.0 Preview Release 1

If you thought the Browser Wars were over, think again. Although many believe Netscape lost the war long ago, the latest Netscape version suggests new battle lines will be drawn—and in interesting territory. PR1 adds a host of tools that will make AOL users transitioning to the "real" Internet feel at home, plus there are a few tricks that die-hard users will love, too.

The entire suite consists of a browser, emailer/newsreader, instant messenger (which speaks of both ICQ and AOL's AIM), RealPlayer 8, Winamp 2.8, Radio@Netscape (a branded RealPlayer front-end), and the latest Flash 6 plug-in. Most of these modules can share links to each other. For example, a click in the Address Book can fire up the browser and display a MapQuest-generated map. The downside to this integration is that Netscape never

feels close to being lean and mean. On older systems, it feels downright slow.

The browser does gain a useful feature in the form of tabs. Though slower than Opera's tabs, they are much faster than opening additional browser windows. The Gecko browser engine (from the Mozilla project) seems more able to render complicated Web pages correctly than Opera at some major sites, but it can take its time. The My Sidebar is new and improved, too, adding such things as your AOL Buddy List, enhanced searching, shopping, maps, and more.

The Messenger module can now directly access AOL and Netscape Mail accounts, much how Outlook Express "speaks" Hotmail. Messenger handles multiple accounts and personalities with more aplomb, too—enough so that you might consider using it instead of a stand-alone product.

Add all this up and the latest Netscape version is worth your time—if you have a speedy machine.

The Tweak Is On

Four Apps That Will Help Make XP Your Own

Microsoft has fashioned Windows XP to be the Borg of OSes, assimilating programs and utilities into its core while hiding the intricacies of the OS behind the convoluted Registry. If XP leaves you yearning for a system to call your own, the tools we've assembled here can help mod your system. Whether it's hacking the interface, optimizing settings, or adding new features, these tools have what you need.

To test these apps, we used an IBM ThinkPad A20M with a 500MHz Celeron and 512MB of RAM.

Efreesky Software MagicTweak

If shutting down the more annoying aspects of XP is your goal, you might like MagicTweak. The app provides a comfortable interface to modify your system's Registry, it's split into Basic and Advanced sections, and it hides unwanted programs, as well as optimizes network settings.

In our never-ending quest for the fastest Internet connection, we were glad MagicTweak could modify our MTU, default TLL (time to live), and other customary settings. Unfortunately, there was not much explanation about the best

choices, and average users might simply select the highest values. Sometimes defaults work best, and here, MagicTweak misses an opportunity to provide solid information to the end user.

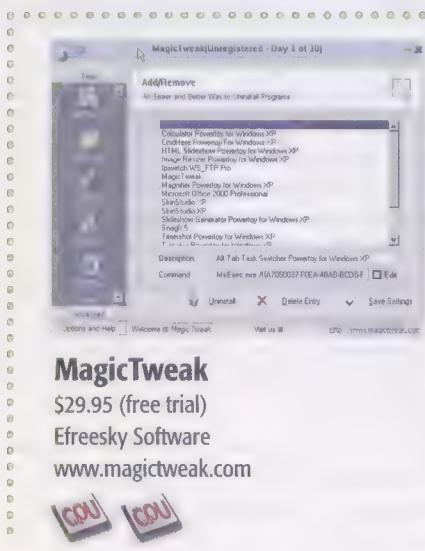
Unfortunately, this confusion proves quite irritating. For example, if you disable File-Close in the IE Options tab, you would be unable to close IE. Deselecting this setting only applies to new instances of IE, so you would have an orphaned application you can only kill through the Task Manager. There are also options to skin IE, but MagicTweak doesn't provide any sample skins.

The remainder of MagicTweak simply revolves around hiding menus and submenus and otherwise locking down your system. Although this may appeal to system admins responsible for maintaining XP networks, they would be better off using Group Policies instead of manually configuring each client.

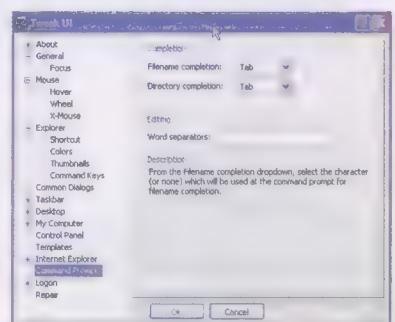
Two features in MagicTweak do illustrate its value. The first is Add/Remove, touted as "An easier and better way to uninstall programs." Ironically, there's no means of adding software through this tool, and if you choose to remove an existing program, it simply launches Microsoft's Uninstaller application. Similarly, Process Info doesn't even rise to the level of Task Manager. Instead, it simply provides the name and number of threads each application has spawned.

Microsoft PowerToys

Microsoft touts the PowerToys lineup as "additional programs that developers work on after a product has been released to manufacturing." There are currently 10 toys you can download free, although Microsoft goes to great lengths to remind you that it doesn't support the tools. Have no fear; these tweaks are relatively benign and uninstall cleanly. If you do harm your system, use XP's System Restore to revert back to a safe restore point.



Among the toys is TweakUI, one of the first Windows tweaking tools and the most powerful Microsoft add-on available. TweakUI plays it safe by not breaking the Windows mold too often. You can modify your mouse behavior, Windows Explorer's color schemes, and command keys. If you're a Unix gearhead forced to support Windows, modifying the command prompt to support tab completion is a must.



Microsoft PowerToys

Free
Microsoft
www.microsoft.com



If a cluttered Taskbar is enough to push you over the edge, try Virtual Desktop Manager. It's capable of providing a maximum of four desktops and brings a great feature of X Windows managers to Microsoft: open up a browser in one virtual desktop while editing a Word document in another. Changing usage patterns takes awhile, but once you get comfortable with virtual desktops, you'll never look back. The only downside was a performance hit. Even with 512MB of memory, VDM was a serious drain on the CPU in our test machine.

Many of us ALT-TAB without even realizing it. For me, the Alt-Tab Replacement toy does wonders, as it displays a

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

preview of an application. If you're browsing several sites, this is a tremendous timesaver.

As part of Microsoft's push to enhance accessibility for users with special requirements, the Taskbar Magnifier takes a portion of the Taskbar and displays an enlarged image of your mouse's focus point. Most users won't need the Magnifier toy, but it's a welcome addition for those who do.

Power Calculator won't leave you trashing your trusted TI handheld, but if you need to do more than rudimentary arithmetic, this utility can save the day. Capable of graphing functions, performing unit conversions, and other math-geek chores, Power Calculator is worth the download.

Overall, PowerToys probably isn't for everyone, but the price is hard to beat. Although some of the toys are gimmicky, most users will find one or two that deserve a place on their system.

Stardock.net Object Desktop

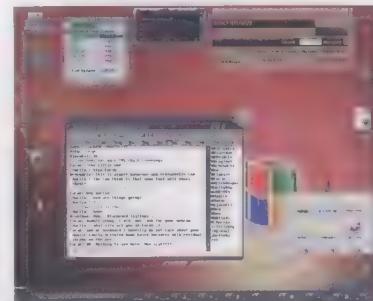
With Object Desktop, Stardock isn't just trying to polish your computer's interface; it's trying to radically reinvent it with tools that let you customize XP's interface and your apps. Composed of several applications, Object Desktop is pricey at \$49.95, but that includes a year's subscription to Stardock's ObjectDesktop.net update service. Object Desktop's main components include DesktopX, WinStyles, IconPackager, and the ControlCenter.

DesktopX is the most intriguing applet, as it lets you configure your Desktop components as objects. These objects can be responsive to system events and feature animations and can be larger than typical Desktop icons. By accessing the underlying COM objects, DesktopX objects can interact without requiring applications to completely load. Objects are also portable, so developers can import them from various supporting Web sites.

Once you create objects for your new Desktop, applying a theme or skinning your apps is the next step. This is where

WinStyles steps in. By providing a consistent theme package, you'll be sure your interface isn't a cluttered hodgepodge of styles. Combined with WindowBlinds, it's easy to have a unique look that separates your system from your neighbor's.

One of the best elements of Stardock's portfolio is one that may tip the scales in its favor: No other enhancement package boasts as strong an online community as Stardock. As the community has grown with Stardock's success, the number of themes, packages, and icons has become incredible. The only concerns with Object Desktop are stability and performance. We consistently found system performance suffered when using Object Desktop. Dragging items across the Desktop was jumpy, and the system was slow to respond to mouse clicks. With the sluggish nature of XP, you may find Object Desktop slows your system to a crawl or makes it unstable.



Object Desktop

\$49.95

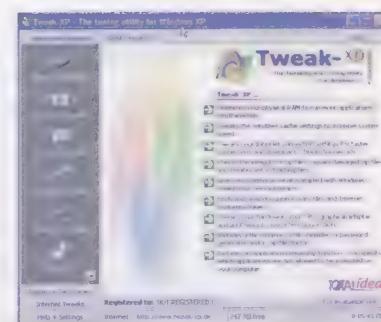
Stardock.net

www.stardock.net



Totalidea Software Tweak-XP

Tweak-XP attempts to hand you the keys to the kingdom, and it largely succeeds. Where other tweaking programs alter the interface or act as a GUI for modifying the Registry, Tweak-XP takes this to a higher level. Totalidea focuses on four areas: System Performance, System & File tweaks, Internet tweaks, and Program Settings. Think of the app as the Control Panel on steroids.



Tweak-XP

\$29.95 (free trial)

Totalidea Software

www.totalidea.de



Some of the best tweaks are application-specific. For example, if you want to edit the attachments Outlook XP will accept, you don't need to muck about in the Registry. If you wish to block pop-up ads in IE, Tweak-XP uses a list of known sites it continually updates. If you find an annoying site that isn't in the database, you can add it.

Like many tweaking utilities available for XP, Tweak-XP also acts as a surrogate front-end to many of the functions the Control Panel performs. This makes it a one-stop shop for many of your management tasks. The only drawback with Tweak-XP is the lack of clear-cut explanations about optimizations you can perform. Totalidea includes an HTML-based Help system, but it doesn't adequately explain the specifics of each modification.

Perhaps best of all is that you can try Tweak-XP free. You're limited to running it 50 times, but that should be enough to decide if it suits your tastes. Tweak-XP smartly includes a configuration tool for System Restore in case a tweak detrimentally affects your system. If spending \$29.95 for a utility doesn't make you cringe, Tweak-XP is the tweaking tool of choice.

by Chris Jackson

Snappy Snaggers

Apps To Grab Your Screen Shots & More

If your job entails producing software documentation or writing articles for computer magazines (welcome to the club), chances are you need to capture screen shots. So, chances are you'll want a good screen shot utility.

The ability to capture screen images is built into Windows. Just press the PRINT SCREEN button on your keyboard and the image will copy to the Clipboard. You can then paste it into an image editor (or Paint) and crop and save it. This method isn't efficient, and it doesn't work with many games or programs that do their own keyboard handling. In short, a screen shot utility can mean better screen shots faster. I compared three screen capture utilities to see how they stack up.

Hyperionics HyperSnap-DX

HyperSnap-DX will capture your screen—and just possibly your heart. It offers virtually every feature you could want, plus the kitchen sink, plus your neighbors' sinks, too.

The program's interface resembles a graphics-editing program, and indeed the app does include a complete set of graphics manipulation tools for touching up your screen shots, including filters and automatic trimming. The color adjustment tools include useful tricks, such as

the ability to substitute one color for another or invert black and white while leaving other colors untouched.

You can set the resolution of the screen shots you make, and you can even set different horizontal and vertical resolutions. This is useful if you'll be outputting to a printer with, say, 300 x 600 dpi resolution. In addition to the GUI, HyperSnap works from the command line, and you can use it for batch or scripted screen captures.

The program can save images in 25 image formats, the most of any program in this roundup. Besides GIF, JPEG, and other staples, HyperSnap saves images as Windows icons and in EPS, FAX, and Macintosh PICT formats. The program can also send screen shots as email attachments or make them your wallpaper.

Like SnagIt, HyperSnap can capture oversized windows by scrolling. In WinXP, the program also offers Extended Active Window screen shots; before capturing a window, HyperSnap asks how big you want to make the window. You can specify any size, even much larger than the physical screen.

To get you started, the program includes several tutorials, including a quick guide for beginners and advanced tutorials with tips for capturing images from DirectX games and DVDs.

Then there are features that are beyond the call of duty. In addition to the computer's screen, the program can capture images from digital cameras, scanners, and other TWAIN devices. If taking all these screen shots leaves your fingers feeling tired, you can control the program using voice commands. Say "capture the active window" and HyperSnap will. This requires WinXP, or for earlier OSes, installation of Voice Command Interface.

In addition to the English version I tested, HyperSnap is available in Italian, Japanese, Russian, and Spanish versions.

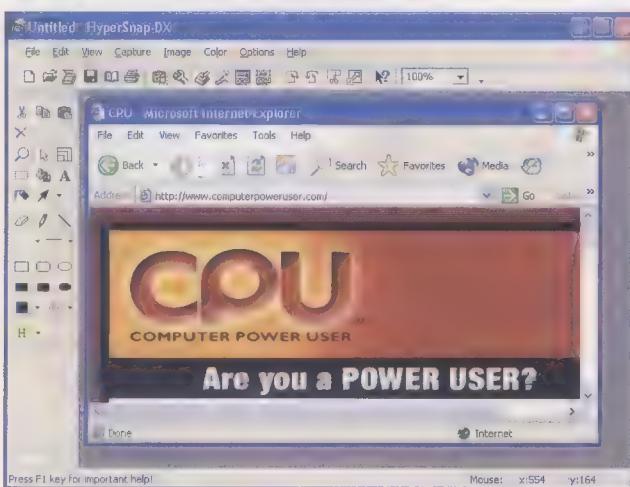
Longfine Software Easy Screen Capture

Easy Screen Capture is the most bare-bones utility we tested. That's not to imply it's underpowered (it beats the pants off of PRINT SCREEN), but it's also not bulging with features of questionable usefulness. However, Easy Screen Capture is easy on the wallet. At \$19.95, it's the least expensive screen shot grabber here.

Easy Screen Capture can grab an entire screen, single active window, arbitrary rectangular region, or single object, such as a menu, toolbar, or button. It saves images in just BMP, JPG, GIF, and PNG formats, but these are the ones most users are likely to need anyway.

The program's image history function lets you review and recover previous screen shots, even if you didn't save them the first time around. Easy Screen Capture also includes a few basic filters, such as contrast and color balance. A scale function will let you resize an image, keeping the proper proportions, although there is no undo command for these image-manipulation functions once you've done so.

Easy Screen Capture was the only utility I tested that had trouble capturing images



In addition to its graphical interface, HyperSnap-DX offers a command line mode for making automated or scripted screen shots.

HyperSnap-DX

\$35

Hyperionics

www.hypersnap.com



CPU Ranking:  0 = Absolutely Worthless   2.5 = Absolutely Average   5 = Absolutely Perfect



Easy Screen Capture has an easy-to-use interface, plus its price is easy on the wallet. However, the program doesn't capture images from games gracefully.

from games. The app's documentation says it can take images from some DirectX games, but I had trouble doing so with the ones I tried. In addition, fast-moving images tended to end up being cropped, and attempting to capture a portion of one game screen caused graphical glitches that can't be described with words. In another game, Easy Screen Capture didn't notice we had pressed the hotkey at all, so no screen shot.

Because Easy Screen Capture is distributed as a ZIP file, installation isn't as smooth as with the other utilities. The program isn't overloaded with features, but it's easy to use and worth considering if you need straightforward screen shots on a budget.

TechSmith SnagIt

Calling SnagIt a full-featured screen shot utility is an understatement. In addition to the common options of capturing a whole screen, a single window, or a rectangular region, SnagIt lets you capture arbitrary regions, such as a triangle, ellipse, or hand-drawn area.

You can save an image in seven common (and not-so-common) file formats. In addition, SnagIt can attach the image to an email message. You can even select multiple destinations for each screen shot. For example, you could save it as a GIF, email it, and print it all at once. An optional preview window immediately shows you the results of the capture, letting you use or discard the image.

SnagIt includes filters that automatically perform color conversion (going to monochrome, halftone, or grayscale), color

effects (such as contrast and gamma) borders, and watermarks.

For an image you want to capture that doesn't fit on a single screen, such as a long Web page, SnagIt's Autoscroll feature fetches the entire contents of a scrolling window and keeps the image in one file.

SnagIt's unique Text Capture feature captures information as editable text instead of graphics. You can use this to extract text from places where copying to the Clipboard doesn't work, such as when you need to copy a list of files from Windows Explorer. Text capture doesn't work in every application—it doesn't use OCR to extract text from a graphics object—but it can be a timesaver.

A Video Capture function lets you create movies of screen activity. This can work for creating quick how-to animations, but the video capture function does not offer editing tools, and you can only save movies as AVI files. In addition, you may have to tweak system settings to get high-quality movies. At millions of colors, SnagIt was able to capture just 2fps, making for a jittery movie.

Easy Screen Capture

\$19.95
Longfine Software
www.longfine.com



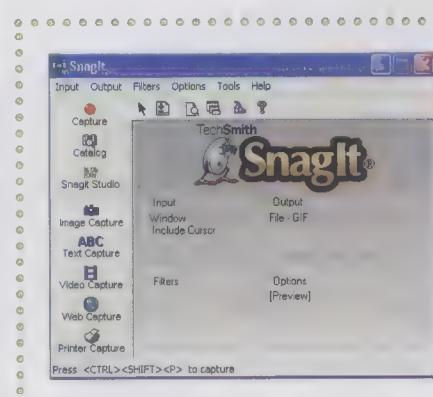
The package also includes SnagIt Studio, a companion application for adding captions and callouts to your screen images. With it, you can easily add arrows that point to an important feature of a screen shot.

The first time you run SnagIt, a wizard guides you through the concepts of screen capturing. This is a simple feature but one that makes the program more accessible to new users.

The Big Picture

Each utility tested here will do the job under most circumstances. Easy Screen Capture and SnagIt have the most intuitive interfaces, but Easy Screen Capture isn't a good candidate for grabbing images from games. HyperSnap and SnagIt are both brimming with features that will ease the workload for technical writers. All three programs are shareware, so download them from their Web sites and try them before committing to one. ▲

by Kevin Savetz



SnagIt has every feature you could want and more, including the ability to capture oversized windows and irregularly shaped regions.

SnagIt
\$39.95
TechSmith
www.snagit.com



321 Studios DVD Copy Plus

Movie studios shouldn't fear 321 Studios' DVD Copy Plus for what it is. They should fear it for what it will become.

With the DVD Copy Plus package and a CD burner, you can make low-quality copies of DVD movies that will play on consumer DVD players. The package is a clumsy bundle of three freeware programs, a 16-step tutorial, and a tech support hotline. Yet DVD Copy Plus hints at what is to come in the near future: quick, easy ways to make perfect digital copies of DVD movies.

DVD Copy Plus' name is a bit misleading. It doesn't actually make DVD-quality copies; it dumps video onto CD-Rs or CD-RWs in VCD (Video CD) format, a low-quality digital video format popular in Asia but less so in the United States. VCDs can squeeze about 80 minutes of video on an 80-minute CD-R; two discs can handle most movies. Menus, subtitles, chapter breaks, multiple angles, and extra audio tracks are lost. You can paste special features, such as deleted scenes, to the end.

The tutorial is clear for people comfortable with Windows' apps, and the VCD community considers the freeware apps (SmartRipper, DVDx, and VCDEasy) to be top-of-the-line. A few dialog boxes in the tutorial didn't quite match up with the apps, and the tutorial didn't explain how to get the software's ASPI drivers (necessary for CD burning) working on WinXP. That information was on 321 Studios' tech support site, however. DVD Copy Plus offers free online and phone tech support. I had trouble getting live online chat support, but the company's phone operators were responsive and knowledgeable.

The VCDs I produced varied from decently watchable to useless. "The Matrix" and "Blade Runner" copied well, though both had obvious video-compression artifacts. Painful skips and stutters rendered a "Wallace & Gromit" DVD and a behind-the-scenes special feature from "The Matrix" unwatchable.

Ripping, encoding, and burning a two-hour movie on a 1.2GHz Pentium III system took about three hours. Sound quality for all copied movies was excellent, though something was missing at the high end. I stuck to the program's

compression-settings recommendations, but 321 says it will walk people through changing compression settings.

Not all VCDs play on all consumer DVD players, even if they advertise VCD compatibility. For example, a Sony unit played Sony and Staples CD-RWs but rejected two Memorex CD-Rs; all four discs worked on a Panasonic player. VCDHelp.com has a continually updated list of discs that work with certain players at www.vcdhelp.com/dvdplayers.php.

(321 Studios was expected to release a new version of DVD Copy Plus in June, possibly with a new name. Look for a review in October's *CPU*.)

An Ensuing Battle?

In a somewhat unusual move back in April, 321 Studios asked a federal judge to declare that DVD Copy Plus was legal. In its court filing, 321 stated that the MPAA (Motion Picture Association of America) had been threatening to sue 321 to stop distributing DVD Copy Plus.

The MPAA had no comment on 321's lawsuit but pointed at past successful litigation against *2600 Magazine* for linking to DeCSS, computer code that lets DVD copiers unscramble a popular copy-protection scheme. (DVD Copy Plus doesn't use DeCSS but a similar unscrambler called VOBDec.) At press time, 321's lawsuit hadn't yet been resolved.

Ultimately, the VCDs that DVD Copy Plus produces can't hold a candle to a decent DVD. However, although DVD Copy Plus only tells users how to make basic VCDs, the freeware tools can make SVCDs, which have a higher-quality image, chapters, subtitles, menus, and dual-audio tracks. 321 Studios reps say tech support will walk consumers through the SVCD-making process.

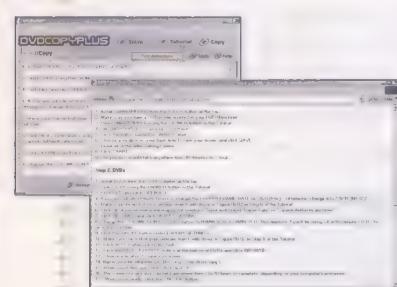
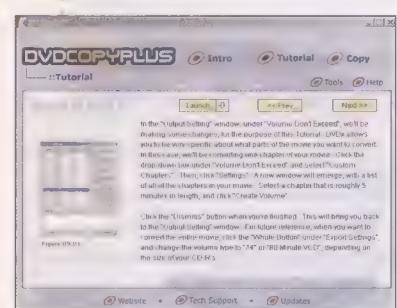
The SVCD format can only store about 40 minutes on a disc, but as DVD burners become cheaper, consumers will be able to fit an entire high-quality movie on one disc—something that could certainly turn a studio executive's daydreams into a horror movie. ▲

DVD Copy Plus

321 Studios

\$39.95

www.321studios.com



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Hertz
Prestige Collection

by Kevin Savetz

RealNetworks RealOne Player

Along with a Web browser and email client, a Real media player is a staple in any Internet denizen's software trove. The latest incarnation, RealOne Player, has a new look and a gaggle of new features—but at a price.

RealOne Player combines functions of the older RealPlayer and RealJukebox. This newer app lets you tune in to online audio and video streams, encode MP3s, burn CDs, transfer music to a portable MP3 player, and browse the Web.

The program uses an elegant but cluttered three-pane interface. One pane shows the clip you're watching, another serves up information related to the clip, and a Web browser lets you surf for more. The versatile program supports more than 50 media types, including several streaming audio and video codecs.

The program is free—but not really. Previous Real Player editions came in two flavors: a free

version and a pay-to-download "plus" version. Now there's just the RealOne Player version. It's a free download, but you need a RealOne membership for full functionality. Benefits include premium content and the full range of RealOne Player features. If you don't pay when the 14-day trial period ends, the program is severely crippled. Say goodbye to the graphic equalizer, full-screen video mode, crossfading, CD burning faster than 2X, MP3 encoding at better than 96Kbps, recording from analog sources, the ability to print jewel case inserts, and more. For nonsubscribers, RealOne is just a rudimentary media player.

Membership has its privileges, but those privileges cost \$9.95 a month. For \$120 a year, we'd rather put the money toward a basic cable subscription and a TV set from the Salvation Army.

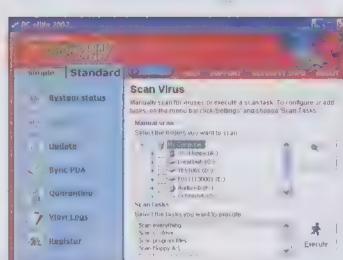
If money is no object, RealOne is a great full-featured media player that gives you access to a ton of premium content. Otherwise, you can cobble together the same functionality using free software and shareware for less than \$120 and have plenty left over for a real movie. ▲



RealOne Player

Free (SuperPass \$9.95 per month)

RealNetworks
www.real.com



PC-cillin 2002

\$39.95 (\$19.95 upgrade)

Trend Micro
www.antivirus.com



Trend Micro PC-cillin 2002

PC-cillin 2002 is Trend Micro's latest incarnation of antivirus software for home PCs. Like a flu shot, it's an annual obligation to keep you feeling well by keeping viruses at bay with file scanning, a personal firewall, and protection for your PDA.

The program's virus protection tools include manual file scanning, ongoing real-time scanning, and incoming email protection. Manual scanning is speedy and thorough, even when searching compressed files and hunting down macro viruses.

The product's software firewall also can protect your PC from Internet hackers. The interface makes an AOL installer seem tricky by comparison, but it sacrifices advanced configurability. A three-position Security Level slider is the only firewall option. The firewall blocks ports frequented by Back Orifice and common Trojans, but the list of blocked ports can't be modified.

The optional WebTrap feature filters out malicious Java and ActiveX code. The Site Filter is supposed to block access to offensive

Web content, but it only blocks sites the user provides, essentially making it useless as a porn filter for children.

The email protection tool checks incoming mail for viruses and Trojan horses as mail is retrieved from the server. No special configuration is needed with Outlook, Outlook Express, Netscape, or Eudora. Other email clients require manual modifications. Scanning is limited to POP3 email accounts. IMAP accounts aren't supported, potentially giving viruses a wide-open door. The package also includes PC-cillin for Wireless, which includes virus protection for Palm-, Pocket PC-, and EPOC-powered PDAs.

Like many antivirus programs, PC-cillin includes one year of updates to protect you against the virus du jour. However, PC-cillin is itself a time bomb. The license agreement states you can only use the software for a year; it's a heavy-handed way to ensure upgrades (\$20 annually) users on a budget won't appreciate. ▲

by Chris Pirillo

Software Just For The Shutterbug

I usually wait for the muse to strike before I start drafting an article for *CPU*. She was out getting a mocha, so I went about retouching some snapshots of Sprocket (my dog). Then it occurred to me: Why not tell people about some nifty digital photo touch-up tools . . . the NEATEST touch-up tools I've EVER found!

Now, as everybody knows, there are very few consumer-level digital cameras that take "perfect" pictures. Software is essential for producing a better-than-average image. Programs like Photoshop Elements and Paint Shop Pro do an admirable job in general, but their tools don't always provide the most pristine results. When you're working with images *en masse*, saving time is also of the essence. You'd be wise to call in some able-bodied reinforcements.

Let's talk color, shall we? Unless you're trying to be artistic, the tones in your photos should be as realistic as possible. Yellows should be yellow, and reds should be red. But getting skin to look like skin, sky to look like sky, and grass to look like grass all in the same image is tricky, to say the least. That's where software like iCorrect Professional from Picto.com (\$79 plug-in; www.picto.com) helps. Simply point to a pixel and "tell" the plug-in what the object is. *Click*. "This is someone's skin!" iCorrect automatically rebalances the photo. In 15 seconds or less you'll go from inadvertent sepia to a true-to-life color spectrum.

What about noise? That's the grainy stuff that creeps into your photo if there's not enough light when the shutter does its thing. Sure, you could reduce the overall size of the image in an attempt to diminish the magnitude of this aberration, but there may be a better way to salvage those megapixels you paid extra for. Neat Image from (of all places) Neat Image (www.neatimage.com) is, bar none, the best ISO corrector/JPEG artifact remover/noise eliminator around. Highlight an affected section of the image, adjust a few sliders, and boom! It's like someone swept the "dust" away without destroying the sharpness of the original image. The more time you spend tweaking this process, the more minor details and textures will be retained. However, the end result will always

be worth more than a thousand words. To become a registered user and get a fully functional edition of Neat Image, you have to purchase a Neat Image Home license. A single-user license is \$30.

If you're a penny-pincher (and in this economy, who isn't?), your pocketbook will really appreciate the free, albeit less powerful, suite of utilities at MediaChance (www.media-chance.com). B/Works colorizes your picture for a more dramatic impact. ColorCastFX

attempts to correct over- or under-saturated photos. CleanSkinFX aims to clean up blotchy skin. FilterSIM simulates filters to warm or cool the graphic. HotPixels Eliminator helps eliminate errant pixels from darker images. RGB Lights brings a rainbow of colors to your object. And there are many others to download, too. No doubt, you'll find something here worth using on a regular basis.

Your photos are finally ready to publish on the Web, but how are you going to get 'em there? OS X users can rely on iPhoto, but Windows users are left in the darkroom. You could just throw 'em into an empty directory, but that would annoy the hell out of your friends. Don't they deserve an easy-to-navigate set of thumbnails? Try Ornj.net. Well, actually that's where you'll find Web Album Creator. Once you load a folder of photos into this free program, you can tweak the output seven ways from Sunday. The results will be fully cross-browser compliant, good-looking, and fast loading. Without a doubt, it's the best album generator I've ever had the pleasure of using. Your friends will be just as impressed!

Oh! It looks like my muse has returned, and with a wily tip. Windows 2000/XP users, try this: Fire up Microsoft Paint (yes, Paint), tap CTRL-O to launch the Open dialog, and in the File Name field enter the full URL of an image on the Web, be it GIF, JPG, or PNG. Instantaneously, the picture will pop into the program. This also works for Web-based documents (HTML, ASP, PHP, and the like) in Notepad and WordPad. ■

When he's not distributing technology tidbits (lockergnome.com) and eBooks (gnometomes.com),

Chris is hosting "Call for Help" on TechTV (callforhelp.tv).

When he isn't preparing for his annual tech conference (gnomedex.com) in Des Moines, Iowa, he's working on developing a download site for software addicts the world over. When he's not writing articles for this magazine, he's sitting around his loft wondering why you haven't bothered to email him yet.

No doubt, you'll find something here worth using on a regular basis.

You can dialogue with Chris at chris@cpumag.com.

by Pete Loshin

Home-Grown Linux



Pete Loshin, former technical editor of software reviews for BYTE Magazine (print version), writes about technology and runs the Internet-Standard.com Web site, which provides plain-language explanations about RFCs, Internet standards, and other IETF documents.

I'll bet you've put together a serious home entertainment system. Or you built your PC, tinker with your car, and more. So why not a do-it-yourself OS?

You could invest time, skill, and money to code an OS from scratch, or you could customize your own Linux distro in a fraction of the time. By itself, "Linux" mostly means the kernel—the bit that dictates how processes and resources interact. Stuff like standard inputs and output and how programs access files, disks, and CPU.

A kernel and \$2 gets you a cup of coffee. To just execute a program you need a shell like Bash (the Bourne Again Shell) or csh (C Shell). The functions that those weaned on Microsoft DOS thinks of as the OS—file copying, deleting, directory listing, etc.—are implemented on Unix-like OSes as separate programs.

Once you go graphical, who's to say that Internet Explorer, when used as a file manager, isn't part of the OS? There's no shortage of graphical browsers for Linux, including Web browsers. We consider the desktop "look and feel" of Windows or Mac OS as a part of the OS, stuff like whether a window's "go-away" button is on the upper left or upper right, or whether you single-click or double-click a resource to open it.

Linux lets you choose from dozens of different windows managers depending on your needs, from the very basic to very bizarre and everything in between (see www.plig.org/xwinman/index.html). Each windows manager offers something unique to start with as you customize your desktop's look and feel. You can spend hours tweaking configurations, but that's not all there is to a custom OS.

Is an editor part of the OS? A spreadsheet or word processor? Windows lets you pick and choose your apps by buying them, but Linux distros give you almost too many, all free. You always have choices, but it's not always clear that if you want, for instance, application "foo," you've also got to install the development utilities "bar" and "baz;" more complications and time wastage as you spend hours tweaking what's installed on your system, ripping out stuff you're pretty sure you don't need, and putting it back when you discover you really do. Don't forget to install the apps you need that didn't come with your distro. But that's not all there is to OS customization.

Here's what I want: a custom Linux distro optimized and compiled from scratch for my system, with FluxBox as the windows manager (the better to customize my window title bars with, my dear), LyX (the better to write books with), Evolution (reading mail with), Galeon (for browsing with), emacs (editing with), and so on.

But how? Start with "From Power Up To Bash Prompt" by Greg O'Keefe (www.tldp.org/HOWTO/From-PowerUp-To-Bash-Prompt-HOWTO.html) so you'll know what the kernel actually does. Then cruise over to LFS (Linux

From Scratch; www.linuxfromscratch.org) and get ready for serious downloading, compiling, and troubleshooting. (For additional options, see the links below).

A kernel and \$2 gets you a cup of coffee.

LFS is more of a body of information surrounded by people who like playing with it than a specific piece of downloadable software. First, read Gerard Beekman's (the guy behind the LFS project) book, and then download packages, create a new Linux partition, install the basic packages on the partition for a basic system that you can use to build your actual system (including the apps you want on your distro). Tweak boot scripts, set up a boot loader, and you're done!

Actually, you've finished starting. That's where the LFS community comes in with its active mailing lists, FAQ, list archives, pointers to resources, and hints for perfecting your LFS installation, burning it to CD, and suggestions for new apps.

Not quite ready for all that? I'd be surprised if you couldn't find someone to do it for you for a reasonable fee.

Go ahead. Try that with Windows.

Links

- Vector Linux; www.ibiblio.org/vectorlinux; lots of customization choices
- Sorcerer; sorcerer.wox.org; scripts to install/maintain everything from source code
- GENDIST; www.bablokb.de/gendist; distro-building toolkit; emphasis on mini-distros for special purposes
- Build Your Linux Disk; byld.sourceforge.net; mini-distro package

Get saucy with Pete at opensauce@cpumag.com.



check it out for things words can't describe.

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Creating the Image

The Coolpix 995

Words From The Web

Yeah, they actually said this . . .

From a Lycos PC hardware message board:

"My AGP port is backwards!"

Try turning your video card around.

You're the only one, George
Any problems with Jar-Jar.
I loved The Phantom
Menace. I didn't have
any problems with Jar-Jar."

From a "Star Wars" forum



From an MSN chat room:

"Third-world countries have computers?"

Yeah, but the poor saps are forced to use AOL.

"I think that if there were . . .
better looking newsreaders
(say Brad Pitt), it would definitely
attract younger viewers."
I'll bet you're no Ashleigh Banfield.

From a "NewsHour With Jim Lehrer" forum about attracting younger viewers to news programs:

Wild Blue Yonder

Massively multiplayer games are a big hit with gamers, but are you ready for *massively* massively multiplayer games? The appeal of online games such as EverQuest and Ultima Online is that you can play with hundreds of gamers at the same time. Massively multiplayer games run copies of their gaming worlds on several servers, with each server hosting a limited number of players. But dividing the game among several servers limits your interaction with other players. You may have a thousand people in your EverQuest neck of the woods at any point in time, but there are thousands of other players logging onto other EverQuest game servers, and you'll never cross paths with them. That's about to change.

IBM and Butterfly.net are giving a new meaning to massively multiplayer gaming with the Butterfly Grid: a big, fat collection of server farms unified into one giant grid that can host *millions* of online players at the same time in one unified online

gaming world. Both PC and console game developers can develop their games to use Butterfly.net. I have a feeling it won't be long before gamers around the world disappear into their basements, never to be heard from again. ▲

Infinite Loop

More Power To The People

We've come a long way in a short time. Today, the average American household has more computing power than existed in the entire world in 1965.

SOURCE: NOVEMBER 2001 DSTX NEWSLETTER



Love Triumphs Over Wall

Is your dream date an assertive, resourceful, self-employed person who likes to stay in on weekends? Tired of hunting in bars, bookstores, and subways for The One? Maybe you're just not looking in the right place. At writeaprisoner.com, you can check out online personal ads from prisoners who can't wait to hear from you.

As you'd expect, most of the ads are from guys looking for love on the outside, but there are a few postings from the ladies, as well. Many of the ads include pictures of your future beau or lass and a few words from the prisoner describing his or her interests. ("I love the outdoors" is a popular one.) Each ad also includes information such as age, gender, race, and, oh yeah, what they're in for and the prisoner's release date, if any. Prisoners pay \$40 to have an ad posted. The ads

aren't just for Cell Block C singles looking to steal your heart, however. Prisoners can also post ads seeking legal help or a good old-fashioned pen pal, no strings attached.

The site also includes prison statistics, prisoner resources, and tips for writing to prison pen pals. Tip #1: Talk about your hobbies and interests, but don't share too much personal information. Good advice. The prison statistics are a little outdated, but here's a notable one: Women account for only 8% of prisoners. Guys will probably have a better chance of meeting their fantasy gal in a hockey team's locker room, but ladies will have plenty of suitors to choose from. Check out the Success Stories section to read reports from prisoners who met their match and fell in love. Makes you feel good all over.

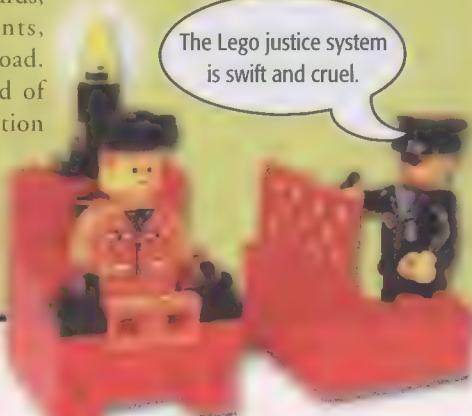
Knock Your Block Off

You would think an art museum depicting human suffering, execution, and torture would be disturbing, but when the artwork is made of Legos blocks, it's just good clean fun. *Lego Death: A Museum of Horrors* (www.legodeath.com) is a twisted showcase of Lego sculptures, and I'm using the term loosely here, of people dying or severely injuring themselves in a variety of fun and interesting ways. Many of the Lego sculptures are surprisingly detailed, complete with a few strategically placed red blocks to represent blood loss.

The *Lego Death* museum has five wings: Ages of Execution, Torture Classics, Occupational Hazards, Domestic Incidents, and Troubles Abroad. I'm especially fond of the Ages of Execution section, which depicts a gallows, a guillotine, a firing

squad, the chair, and a gas chamber. The Torture Classics section includes an iron maiden, a rack, and a scene depicting a burning at the stake. The Occupational Hazards section has a James Bond-inspired torture device. Don't forget to stop by the Disgraceland sculpture in the Domestic Incidents section. That's a good one. In the Troubles Abroad area, you'll find a sculpture of an unfortunate soul dying at the hands of feral monkeys and another of an explorer being boiled in a kettle next to a smiling cannibal. This is the essence of art. Can a dismembered Mr. Potato Head be far behind? ▲

The *Lego justice system* is swift and cruel.



Online Mood Ring

Think you know yourself pretty well? Find out what you're really feeling at the Colorgenics Web site (www.colorgenics.com). This little online application will tell you what kind of mood you're in based on colors you are attracted to. The program will display eight colored cubes, and you're supposed to click the cube that "you feel most in harmony with." Keep clicking until all the cubes have been selected, after which the program will generate a long description of your mood.

Unlike many personal profilers, Colorgenics isn't full of the typical warm fuzzies, such as, "You're a sensitive and proactive leader whose witty banter is enjoyed by all." I ran several random profiles choosing different color combinations each time, and each profile explained why I was stressed out or anxious. None of the profiles included "Your article is three days late and your editor is pointing a shotgun to your head," so it's not 100% accurate. Still, Colorgenics is an interesting way to measure your current mood and waste a few minutes to boot. ▲



If you find a strange, interesting, or funny Web site in the course of your Internet travels that you think is worthy of *Fringe*, send your suggestion to fringe@cpumag.com



MP3.com

The Long & Winding Road

We normally think of a revolution as the glorious overthrow of established oppression or a foolhardy attempt at change that resulted in failure. The MP3-centric "digital music revolution" has fallen somewhere in between. The populist armies that rallied behind the likes of Napster and MP3.com made themselves heard in the halls of major recording labels only to see their leaders bayoneted with lawsuits and left to die.

Founded in March 1998, MP3.com sought from the very beginning to offer a forum in which small, independent artists could feature their music, sell CDs, and maybe—just maybe—get noticed by the big labels. The irony was that MP3.com did draw the music industry's attention, but in a wholly different way. The company tried to keep things legal, but with each increasing innovation, MP3.com marched ever closer to war with the RIAA (Recording Industry Association of America), the legal body guarding the major music labels.

War was declared between the two at the dawn of 2000. Typical of most wars, you could say that nobody won, although, in a sense, the battle is still being waged. The final prize will be the day when music lovers all over the world can download any song for a reasonable price and use it however they wish as part of their private media collection. Unlike Napster, MP3.com is still active, and although its guns may be set aside, the company is still playing a large role in achieving this far-off goal.

Glory Days

MP3.com's IPO arrived in July 1999, right about when the RIAA was nearing its

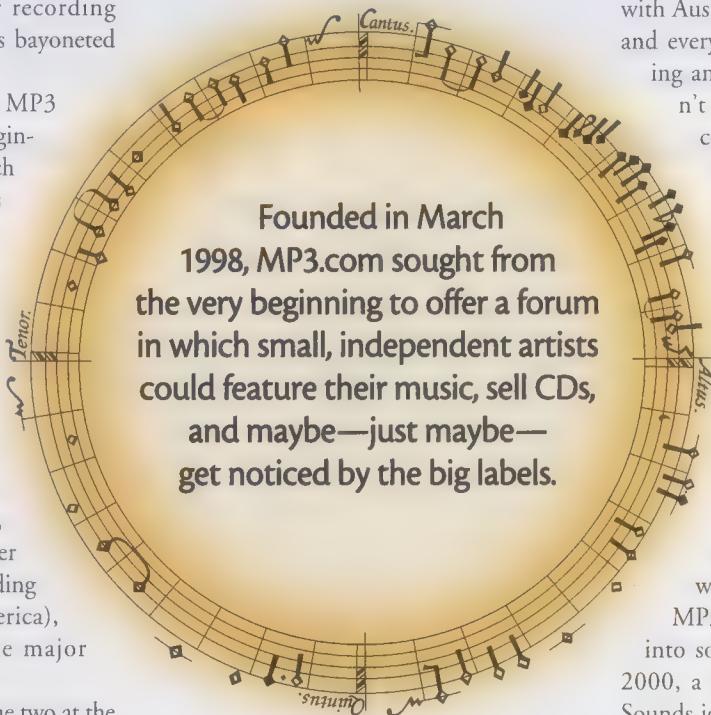
final specification on the SDMI (Secure Digital Music Initiative). MP3.com's offering sailed on the crest of the dot-com frenzy and generated a company valuation of \$1.2 billion. The SDMI sunk like a rock from lack of manufacturer support and is now the butt of many jokes in digital rights management circles.

programs, such as MP3's Payback for Playback, offered artists half of 1 cent for every stream played. This might not sound like much, but even some payment is better than letting demo tapes gather dust.

Then-CEO Michael Robertson evangelized digital music to the world. MP3.com was the forum in which Europop-synth geeks could rub shoulders with Australian aboriginal folk composers and everyone had an equal shot at finding an international following. It didn't matter that the vast majority of content on the site was amateurish drivel. The important thing was that Robertson had at last delivered a music model that would end the decades of tyranny enforced by major record labels. Prices for music were fair. Artists were paid well. Consistent quality would come when big-name bands got in on the act.

Did the big name bands ever come? Generally, only when they were paid to do so. Did MP3.com manage to turn nobodies into somebodies? Perhaps. In January 2000, a talent scout with the label 2K Sounds joined forces with Virgin Records to offer 14-year-old Brooke Allison a contract after a friend uploaded a couple of her songs. (The result was the pop single "The Kiss-Off." Yeah, we missed it, too.) There are similar stories, including Linkin Park, but not many. The chasm between online and offline music industries remains vast.

As for MP3.com's DAM CD sales and Payback promotion making an indie artist huge, you might set the bar at the company's highest paid performer, Mexican pianist Ernesto Cortazar. At the end of March 2001, Cortazar made headlines when he passed the 2 million download



The new company's early success hinged on its core service: promoting unknown independent artists. Any band could upload its music into MP3.com's indexed database for the world to download and enjoy. If a listener wanted the music for his private collection, he could order a DAM (Digital Automated Music) disc, which offered the album's conventional CD Audio tracks plus the same tracks burned in MP3 format. All profits were split 50/50 between the artist and MP3.com—a royalty rate unheard of in conventional music publishing. Other

mark. Despite these huge numbers, though, less than 4,700 DAM CDs of his music had sold. Cortazar's total take to that point was roughly \$37,000.

Where MP3.com excelled was in developing new methods for distributing its content to businesses and consumers. In

particular, the My.MP3.com service rocked the music industry by releasing music from its ties to physical media. The fundamental concept was that once a person owned music, digital technology could and should be used to make that content available anywhere without interference

from physical media limitations. It was an idea born several years too soon.

Good Times, Bad Times

On Jan. 12, 2000, MP3.com announced My.MP3.com with two services: Instant Listening Service and Beam-it. Instant

Tell It Like It Is: Interview With Derrick Oien, president, Music and Media Group, Vivendi Universal Net USA, former COO and president of MP3.com



CPU: Are the various Vivendi sites complementary or redundant?

Oien: They're extremely complementary. If you go to MP3.com and search for "Madonna," you'll find songs that are free on MP3.com, videos at GetMusic, and news about Madonna and a discography at RollingStone.com. If you're looking for somebody a little more indie, like Tom Waits, then go to eMusic.

Also, each site has a different target. MP3.com appeals to people who like to discover music. If you're a baby boomer, RollingStone is definitely the place to be, but RollingStone is also leaning more toward the teen market. GetMusic gives you a flavor that's more like MTV

on the Web. Compare this to AOL, which is taking more of a monolithic, integrated approach. What we're doing is developing different brands to appeal to different audiences.

CPU: Do you feel like you're still competing with all of the file swapping sites?

Oien: I don't compete with peer-to-peer file swapping sites because they don't have business models. They're giving stuff away for free. Call it what you want—file swapping or file stealing. To be honest, I don't have a dog in that fight. We have a legitimate subscription service, which I think is the best subscription service on the planet. We have a dedicated, growing group of followers who are willing to get out their checkbooks each month for us. You can't say that about KaZaA or Morpheus.

CPU: What should we all learn from the digital audio wars?

Oien: The hardest lesson of all from the Napster phenomenon is one of demand finding its own supply. There was clearly a demand for a digital product, and the content providers weren't making that available, so the market found its own supply.

CPU: Will we be able someday to go to a site offering major label acts, pay a buck or two for a track, and then be able to own it and do with it what we want within our own private use?

Oien: I believe it will happen...I don't believe it will happen in the near term, meaning two, three, four years. It's not a technology issue; it's really a licensing issue. In the last couple of years, I've learned unbelievable things about intellectual property and copyright laws. If we look at a song like "Bye Bye Miss American Pie," it may be owned by one of the majors, but there may be five to 10 publishers of it. The new Eminem album that just came out has multiple publishers on each track because of all the samples. Just the five majors probably have 20,000 to 50,000 publishers at any given time. What it's going to take to get to a point where all of that publishing can be cleared before that content can be made available to a consumer is an unbelievable nightmare.

CPU: What is the biggest problem facing MP3.com today?

Oien: I'd have to say providing a whole offering to the consumer, a complete music selection and usage experience, which is something no one does today.

Expansion of broadband infrastructures is probably one of the biggest issues right now, too. I think the roll-out of new consumer electronics devices have been impeded by some of the content holders over security issues. Right now, you have three factions fighting: Content providers fighting to protect their copyrights are on one side. On the other side you have the consumer electronics manufacturers who need new products in the market to keep margins up. There's also the broadband companies. As broadband penetration starts to slow, you see the companies saying that if they had more content, they'd sell more broadband. So all three of those players are busy lobbying in Congress right now.

CPU: Who will win?

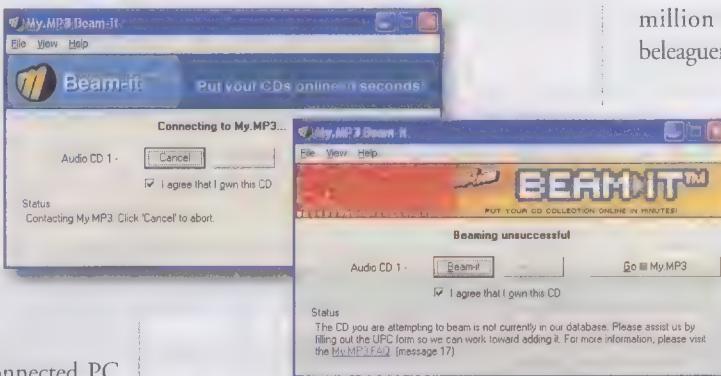
Oien: Probably whoever has the most money. If I had to pick, I'd say the telcos and the consumer electronics manufacturers tend to have a little more to put into the coffers of people running for office.

Listening Service let customers purchase a CD from any participating retailer, then immediately start streaming that disc's content via a portal site. The idea was a great step. Once ownership is established, why wait for shipping to start enjoying the purchase?

Beam-it let users insert their CDs into an Internet-connected PC and receive access to that CD's content via Web streaming. Rather than upload the disc, MP3.com prepped the content from some 45,000 popular CDs so that all the user had to do was insert the CD to demonstrate proof of ownership. Users could then use their My.MP3.com accounts to reorder these tracks into new, multiple-artist playlists.

The trouble with MP3.com's "listen-without-limits" philosophy was that it violated the central tenet of traditional music sales: When you buy a CD, the label is not granting you unlimited use of that disc's contents, the company is licensing you the right to play that particular piece of media as much as you like. The reason the recording industry has moved so slowly in making digital content available is that digital media negates this industry-revered licensing model. Michael Robertson often commented that such a service, which he said was based on accepted fair use practices, would do for music sales what VHS did for movies. The RIAA said that making copyrighted content available to anyone who could procure a copy of the appropriate CD established no proof of ownership and was thus a blatant copyright infringement.

MP3.com wanted ultimately to make the Instant Listening Service into a subscription-based offering, but the RIAA's lawsuit of Jan. 21 knocked those plans into a spin. However, MP3.com fired back on Feb. 8 with its own suit against the RIAA and the organization's CEO, Hilary Rosen, over unfair business practices. Robertson alleged that Rosen and her nonprofit organization had conducted a 2-year



Thanks to licensing issues and a relatively small database, Beam-it doesn't live up to its promise.

campaign of interference and sabotage in continual efforts to turn advertisers, analysts, and artists away from MP3.com. The following month, MP3.com dropped its suit against the RIAA. Rosen elected not to reciprocate.

Predictably, the courts sided with the RIAA. On April 28, Judge Jed Rakoff found MP3.com guilty of copyright infringement, saying that the case was so clear that no trial was needed. It didn't matter that MP3.com continued to post increasingly encouraging quarterly reports or that the company struck a key licensing agreement with BMI in early May. On May 10, MP3.com sliced all major label content from the My.MP3.com service and commenced the many-month process of settling with the major record labels. By mid-September, only Universal was left with an MP3 bone to pick. The court had determined that MP3.com had infringed on 4,740 Universal CDs and awarded \$25,000 in statutory damage per disc—a \$118.5

million body slam against the already beleaguered company.

The following several months found MP3.com plodding along, scoring what few PR victories it could manage in statistics and user numbers. In retrospect, the company seems to have been in a holding pattern, waiting for the inevitable. In May 2001, Vivendi Universal announced its acquisition

of MP3.com.

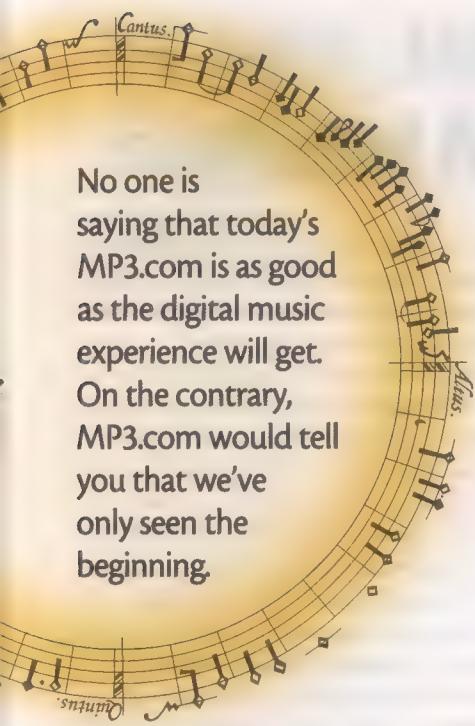
Back In The Saddle Again

The Vivendi acquisition is a mixed blessing. On one hand, the deep pockets of a major label have helped MP3.com not only stay afloat in a terrible online economy, but also become stronger through its integration with several other Vivendi properties, namely RollingStone.com, EMusic.com, GetMusic.com, and MP4.com. The company is still able to provide a showcase for struggling independent artists and, every once in a while, help one on to bigger and better places.

On the other hand, the days of gaining customers and attention through the use of questionable legal interpretations is gone. The Beam-it and Instant Listening services are still present, but as these are not profit-generating services for MP3.com, they aren't really promoted. In our experiments with the service, we found a large number of tracks and discs that were either not in MP3.com's database or were still locked because of rights issues. MP3.com offers 15 beams for free, but additional beams require subscription to the Premium Listener Service for \$2.99 per month (three CDs/month) or \$29.99 per year (50 CDs/annually). A paid subscription does nothing to make locked tracks or albums not in MP3.com's database available.

However, DAM CDs are still alive and well, and all DAM CD content is available for streaming via the user's My.MP3 account. MP3.com now also offers

The trouble with MP3.com's "listen-without-limits" philosophy was that it violated the central tenet of traditional music sales.



No one is saying that today's MP3.com is as good as the digital music experience will get. On the contrary, MP3.com would tell you that we've only seen the beginning.

netCDs for many indie artists. Essentially, a netCD is the ownership of a CD's content via a My.MP3 account. The owner gets no disc, but he also usually saves a few bucks on the album cost and can either stream or download songs.

In May 2000, Michael Robertson gave an interview on the Motley Fool radio show in which he said his long-range vision for MP3.com was to enable the "CD jukebox in the sky," a concept wherein users access an online database of their private music collection and play that content anytime, anywhere, and on any playback-capable device. Today's CEO, Derrick Oien, still pursues this vision. netCDs are one part, but so is MP3.com's Transfer2Device. This application lets users download tracks straight to a portable music device rather than having to two-step the process by saving to the PC's hard drive. Going forward, Vivendi Universal last year acquired Moviso, a leading provider of wireless services, with the intent to distribute everything from ring tones to music tracks.

Aside from marketing MP3 hardware and selling subscriptions to its own MP3 jukebox software/service for \$2.99 per month, MP3.com also offers several

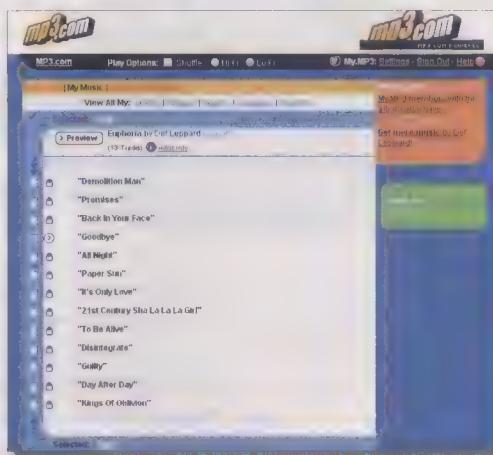
business products, including audio stream hosting, radio services for broadcasters, and customized audio streams for background music. Additionally, MP3.com is a pressplay affiliate, offering subscription-based content from Universal, Sony, EMI, and Zomba.

MP3.com is not the innovator it was in 1999. That role has become a three-way tug-of-war between the big label lawyers, listening public, and small application developers such as Moviso. Nevertheless, MP3.com remains significant for its stature as the preeminent MP3 portal. An average of 200 new bands sign up and 3 million streams go out at MP3.com every day. If there are new (legal) music services to be tried, this will likely be their testing ground. CEO Derrick Oien already has plans for MP3.com to start distributing content into all kinds of devices, everything from PDAs to set-top boxes. And, of course, MP3.com is still one of the best ways in the world for an unknown band to take a shot in the dark at stardom.

Much of the old MP3.com is gone for good, buried by the need to generate dollars instead of headlines. But what is left are the kinds of music services we can all anticipate

enjoying in the coming decades. No one is saying that today's MP3.com is as good as the digital music experience will get. MP3.com would tell you that we've only seen the beginning. The best is yet to come. **CPU**

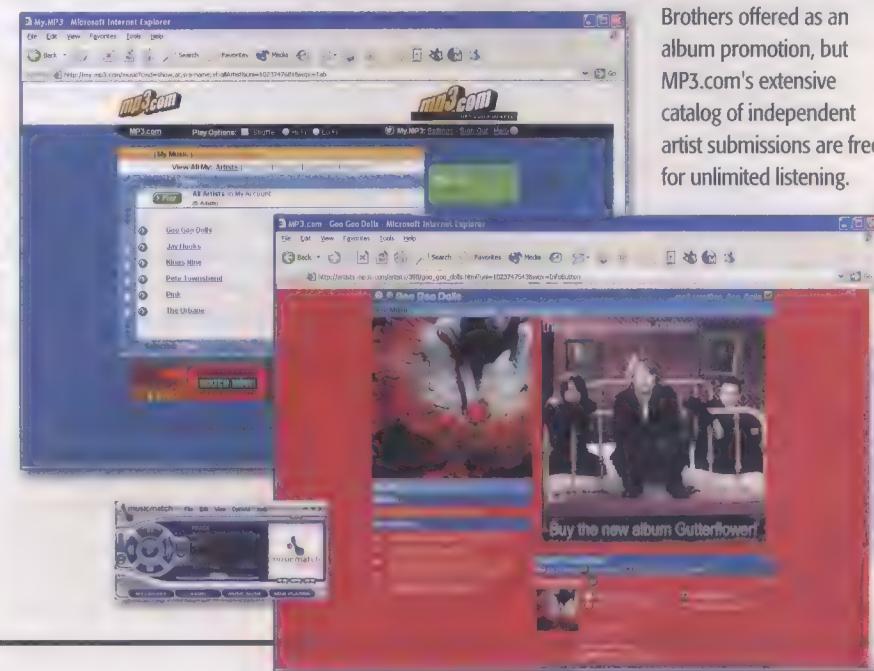
by William Van Winkle



MP3.com fights a constant battle against legal restrictions that keep it from offering its users access to files. Even when trying to sample the tracks from Def Leppard's most recent CD at a low bitrate, all songs except one were locked against playback.

My.MP3.com is a sort of music locker you can reach from anywhere you have a Web connection. Big label songs are usually off-limits, save in cases such as this Goo Goo Dolls track Warner

Brothers offered as an album promotion, but MP3.com's extensive catalog of independent artist submissions are free for unlimited listening.



Coder's Corner: XML

Programming & XML, Part 2: Parsers & The DOM Interface

In *Coder's Corner: XML*, Ian Graham shows you how to program with XML. Ian is the author of numerous books pertaining to Web development, including "The HTML Sourcebook" and "The XML Specification Guide."

Last month's article introduced the XML parser, which is the piece of software that takes in XML data, checks that it's correct, and makes it available to a program. We also looked at the SAX (Simple API for XML) parser interface to illustrate how you hook a parser up to your own code so you can create programs that read and use XML.

The SAX interface, however, is pretty low-level and mostly of interest to hard-core XML software developers. This month we'll discuss a more common parser interface known as DOM, or Document Object Model.

Get To Know DOM

To seasoned Web developers, DOM will seem like old hat. This is because DOM is based on the programming APIs originally developed to create DHTML (Dynamic HTML), as originally implemented in Internet Explorer 4 and Netscape Navigator 4. Thus, the DOM for XML is based strongly on this approach for hooking an application up to HTML data, as opposed to XML.

As stated last month, the DOM is a *document-based API*. Whereas a SAX-enabled parser simply executes a series of event handlers as it processes XML (sort of a "fire and forget" approach), a DOM-enabled parser actually creates an in-memory "document object" containing the XML data. The DOM interface then provides methods that let an application access this document object, locating elements, attributes, and text based on their positions within the document tree. The interface also lets a program modify the document (adding new nodes, changing their content, etc.), attach event monitors

to the tree (to detect when an element changes, for example), and so on. Indeed, DOM-like functionality is essential for many common XML applications, such as XML browsers and editors.

To illustrate the DOM, let's look at some JavaScript code that uses the DOM to access XML data, identify the types of all the nodes (elements, attributes, and text), and write out an HTML document listing the nodes and their properties. This particular example is designed for the Mozilla or Netscape 6/7 browsers. When the browser loads an example XML document, such as what follows, the browser automatically parses the XML using the integrated XML parser and makes the data available via the DOM interface:

```
<?xml version="1.0" ?>
<xmltest xmlns:html="http://www.w3.org
/TR/REC-html40">
<fooBarNode />
<bigHairyNode>
  <subNode> <subsubNode /> </subNode>
</bigHairyNode>
.... more XML data ....
<html:script src="tree-traverse.js" />
</xmltest>
```

The second-to-last line is an HTML SCRIPT element that references our JavaScript program (tree-traverse.js). Mozilla/Netscape 6/7 loads this program, which then has access to the DOM object provided by the parser. The program can thus access all the data in the document.

The main body of the script program is below:

```
contentString = traverseTree(document
.documentElement);
startString = '<html><head>... the start of the
HTML document ...';
endString = '\n</ul>\n<hr></body></html>';
myWin = window.open();
```

```
myWin.document.open('text/html')
myWin.document.write(startString +
contentString + endString );
myWin.document.close();
```

The first line passes the root element of the document object to the function `traverseTree()`, which is the function constructed for this example. The DOM standard specifies that the `documentElement` property of a document object identifies the root node (or top-level element) for it. Thus the `traverseTree()` function starts at the top.

The next two lines simply prepare beginning and end strings needed to make up a complete HTML document: The `traverseTree()` function invocation (discussed later) returns a text string that contains a chunk of HTML listing the nodes in the document and their properties. The final four lines open a new browser window and write the descriptive HTML document into it. The new window then displays the HTML page, illustrating the XML document's structure.

A Technical Tree

How does `traverseTree()` work? The following excerpt from the start of the function illustrates the main features:

```
function traverseTree(node) {
  if(node.nodeType == Node
  .ELEMENT_NODE) {
    var name = node.nodeName;
    myString = '<li> <b> Element:</b>
    '+name;
    if( node.hasChildNodes() ) {
      myString = myString + '\n<ul> \n';
      var i;
      for( i=0; i<node.childNodes.length;
      i++) {
        myString = myString +
          traverseTree(node.child
          Nodes.item(i));
      }
      myString = myString + '</ul> \n';
    }
    myString = myString + '</li> \n';
  } else if(node.nodeType == Node.TEXT
  .NODE) { // other node types
```

Essentially, all the method and property names used here are defined in the DOM specification. For example, DOM specifies

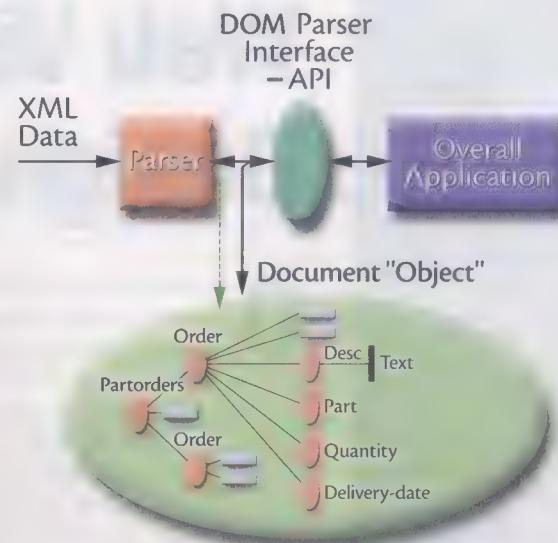
that any node has a "nodeType" property defining the node type, a `nodeName` property that gives the name, and a `hasChildNodes()` method that's true only if the node has child nodes (for example, an element containing text and/or other elements). DOM also specifies a node interface, defining type identifiers for all the different possible types of nodes (`Node.ELEMENT_NODE`, for example).

What does this part of the function do? If the node is an element, the function creates a string that formats the element name inside an HTML list item. If the element has child nodes, the function starts a new HTML list (``) and loops over these child nodes (`node.childNodes.length`, another DOM property, tells how many there are), and recalls the `traverseTree()` function for each (the DOM `node.childNodes.item()` list references each node). These nodes may recall the `traverseTree()` function if they in turn have child nodes. Thus `treeTraverse()` recursively traverses through all the nodes in the document—element, attribute, text, or other—adding information about them to the global HTML string.

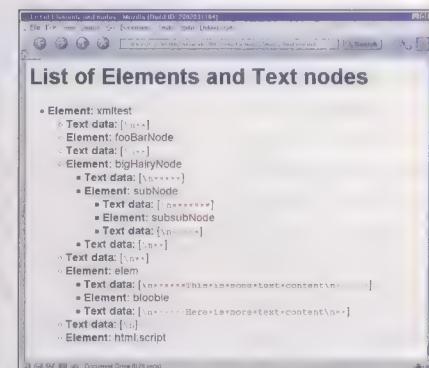
IE5 and later can do pretty much the same thing, although the setup is a bit different (example code is available at www.smartcomputing.com/cpumag/aug02/xml examples or www.utoronto.ca/ian/articles/aug02.) An interesting difference is that IE lets you specify the DOM parser you want to use. Here is how it's done using JavaScript:

```
var xml = new ActiveXObject
("microsoft.xmlDOM");
xml.async = false;
```

The first line loads the desired parser (a standard Microsoft ActiveX object here). The second line sets the parser's operating mode ("async" means the document is not accessible until parsing is complete).



This illustration of a parser with a DOM interface details how the parser reads the XML document and creates an in-memory representation of it. The DOM interface lets the application interact with this document object to read or modify the document or detect changes in it.



Here you see the results of the processing of an XML document example in a Mozilla browser. The script program has extracted information from the document object and written out the displayed HTML page.

You also must tell the parser which XML document to parse. This is done via `xml.load("./test-xml.xml")`, which loads the doc and makes it accessible via the DOM.

There's still much to learn about DOM. See www.smartcomputing.com/cpumag/aug02/xmlexamples or www.utoronto.ca/ian/articles/aug02 for links to official DOM specs, tutorial sites, and full examples of the partial examples in this article. **CPU**

by Ian Graham

Web Visual Design Strategies

One of the more popular lectures that I give at conferences is how to apply basic graphic design principles to Web site design. In this article, I'll share three simple concepts that anyone can use for building everything from complete Web sites to HTML emails and Flash presentations. The three strategies: "Design Big, Medium, and Small Areas;" "Break Up the Page into Digestible Chunks;" and "Group Like Elements" not only create a nice visual design, but they also enhance readability and, therefore, usability.

Design Big, Medium & Small Areas

If you go to www.apple.com, you'll see a classic example of the Big, Medium, Small design strategy in action. The idea behind this strategy is to break up the page into three sections so that you establish a clear visual priority—guiding the user's attention to the three sections in the correct order.

The big section literally contains the biggest collection of an image and headline along with some bullets or caption elements all nested together so that the overall effect is one large chunk. As of this writing, the big section of the Apple Web site discusses the Xserve. Notice that the big section, in this case, is in the middle of the page. The three sections can be organized vertically or horizontally and placed anywhere on the page—the key is simply that you have the three.

The medium section of the page contains the next most important grouping of information. On the Apple site, the medium chunk is the lower portion of the page containing a few headlines. Finally, the small section is the least most important space. In the case of Apple's site, the navigation bar is the small section. This is not to imply, however, that navigation isn't important. The assumption is that everyone knows a nav bar

when they see one, and so it does not need a lot of visual priority.

Break Up The Page Into Digestible Chunks

Because a Web page is a relatively small communication medium, page real estate is always at a premium. To fit the most content onto a Web page, yet create the illusion of more space than is actually available, ironically, you must add design elements. The types of design elements to add are blocks of color behind certain text areas or horizontal or vertical rule lines to help separate content elements. These types of design elements help to break up the Web page into a few digestible chunks for the eye to focus on. Newspapers are a classic example of this design strategy. The columns, rule lines, and images

concentrate your eye on specific areas of the page and allow you to temporarily block out other sections.

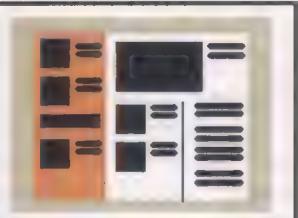
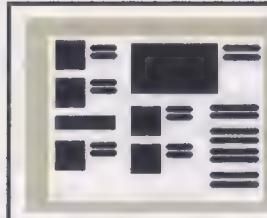
Group Like Elements

Finally, you can imply a lot

of functionality simply by grouping like elements on the page and giving them the same visual treatment. For example, if you dedicate one area of the screen to a bulleted list of news highlights, people will assume that everything in the list functions the same way—they all link to a story page. The same logic holds true for navigation elements. You do not, for example, need to make your buttons beveled with drop shadows to make them look clickable. If a section of the page has a blocked off area with simple text labels done in the same font, it suddenly looks like a navigation bar. It's important, however, to be mindful of this phenomenon. Don't include an element that functions differently from everything else in the group or people will really be confused! ■

You can contact Lisa at lopuck@cpumag.com and see her work at www.lopuck.com.

Lisa Lopuck, www.lopuck.com, is a Web creative consultant helping companies define and plan their Web creative strategy, information flow, and visual look and feel. She is also the author of numerous best-selling books on Web design, including "Web Design for Dummies," and is a sought-after speaker at Web conferences and universities around the world.



Ironically, you can create the illusion of more space and enhance readability by adding graphic elements.

audiotrn.txt

I've been using the AudioTron now for nearly a year as my primary MP3 player at home, and I figured this would be a good chance to share my feelings about it with you. There are numerous digital jukeboxes on the market today. They largely fall into two form factors: handhelds like the iPod and the Nomad and stereo components like the AudioTron.

Portable players vary tremendously in storage capacity from an hour or so up to many gigs. But regardless of the storage type and the size, all players have a shortcoming: they need local access to a collection of audio because they move from place to place.

However, I rarely leave my office. So for me, things like battery life just don't matter at all. The most important consideration for me is the ability to store as many songs as possible. Most stereo component MP3 players rely on a large internal hard drive. These range from just a few gigs on up to the largest IDE drives that can be had.

The thing is that most of these units charge a fantastic premium for their gigantic disks. This sucks when you consider the fact that a 100+ gig drive can be had for a couple hundred bucks. Your PC can easily house a pair of drives, giving you access to several thousand CDs for less than the cost of many of the stereo MP3 players.

The AudioTron dispenses with this problem by having no internal storage of its own. Instead it relies entirely on other hard drives on your network using Windows File Sharing, or better yet, Samba for you Linux folks out there. This makes things a little trickier, but the upside is that you are only required to maintain a single archive of music, and you can access it wherever you have an Ethernet jack and a stereo.

Now you just share your tunes from whatever hard drives you have spun up on your network, and the AudioTron takes care of indexing them. Your only job is selecting what you want to listen to using one of several available input mechanisms; normally

this is the simple buttons and knob available on the front of the unit or the simple remote included with the unit. But we're just getting started.

With the newer firmware releases, Turtle Beach has continued to expand the feature set of the AudioTron. First a Web server made it possible for you to configure the AudioTron from any machine capable of running a Web browser. And the newest beta firmwares feature a new API for native applications to control the thing.

There's a Windows client, a MacOS client, and a Java client that works on several platforms, including Linux. I got bored and spent a few days and wrote a Gtk Perl application just for giggles. It was surprisingly simple to slap together most of the functionality that I wanted in just a few hours. Doing more complicated tasks started showing the shortcomings of the API, but I have yet to find another player that offers the same level of customization.

The device isn't perfect. For example, the Web server is very slow. The device simply isn't equipped to handle large quantities of data quickly. It's alright for one person, but if more than a couple of users tried to control the device using any means besides the remote control, things would get slow.

The thing that I dig about this device is the fact that Turtle Beach has continued to enhance it. When I bought my first AudioTron, there was no Web server and no API. But now it has that, plus nifty features like 'Net time server syncing and alarm clock functionality. This little box keeps demonstrating that it is capable of learning new tricks. And the API ensures that third-party developers will continue to trick it out in the future.

Now if only my cell phone were as flexible. ■

Sing a song to Rob at malda@cpumag.com

Rob "CmdrTaco" Malda is the creator and director of the popular News for Nerds Web site Slashdot.org. He spends his time fiddling with electronic gizmos, wandering the Net, watching anime, and trying to think of clever lies to put in his bio so that he seems cooler than he actually is.

Future Game Developers



Starting as gopher for the Emmy-winning team that pioneered live in-car TV cameras for the *Indy 500*, Joan became an independent video/sound engineer, technical director, and producer. Playing with Reality Engines and motion platforms led to co-founding

Xatrix Entertainment where she produced the two *Cyberia* games. Before 3D acceleration was trendy, she formed Mango Grits to develop hardware-only game *Barrage* for Activision.

Since cashing out from *SharkyExtreme.com*, where she was co-founder and managing editor, Joan has retired.

If you really love computer games, you already read BluesNews.com on a daily basis. If you've gone over the edge and decided you want to make games, the large volume of online resources now available can be overwhelming. From traditional game developer sites such as Gamasutra.com to game engine licensing/publishing business models such as GarageGames.com, you should be able to find whatever you need to get started and keep moving toward your dream of game creation. Gamasutra is aimed mostly at working (or at least previously working) game professionals, so don't be intimidated if you aren't one. Topics range from technical to creative to business aspects of game development. At the other end, GarageGames, founded by some of the guys who created the *TRIBES* games, offer their reasonably priced (\$100 per programmer) Torque game engine for license with the requirement that you must publish any game you create with it through their company.

If you like to study a subject to death before actually doing something and also have money to burn, invest \$189 in the entire eight-year CD-ROM collection of back issues of *Game Developer* magazine. You might want to blow another \$150 on the 2002 GDC (Game Developer Conference) Proceedings. Both are available at the Gamasutra.com store, make for some great reading, and could help you postpone actually programming something for at least six months.

If you are the type to shoot before aiming, jump right into the hands-on stuff. To find out if you really want to make games, download a trial version of something like Conitec's 3D GameStudio (conitec.net/a4info.htm) and see if you actually lose sleep playing with it the way you do a new game. If you do, welcome to the nuthouse. Now go buy a compiler and get started. If you do not, head on back to Blue's News and thank your railgun that some shluh out there wants to stay up all night making games for you. If you've noticed that there are a lot of "ifs" in this column, good. Game development is not for the dabbler. It is hard work and involves long hours and no sleep, and there are no guarantees of success. It is also one of the most

engaging, creative, and challenging things you can do with a group of fellow nerds and a computer. If you truly have the calling, do not give up. New tools and innovations, like Cg from NVIDIA (developer.nvidia.com/Cg), are making even advanced shader programming more accessible.

Search far and wide. The GameDev.net site has a resources section for beginners (gamedev.net/reference/start_here/) that covers many important topics. For handy 3D graphics-related links, try Ultimate 3D Links (3dlinks.com). GameTutorials.com also has resources for getting started and a hefty links page. If you need help getting parents or spouse to support your new endeavor, Bob's rant on GameProgrammer.com is pretty good ammo, even if the site is out of date. The Game Development Search Engine (gdse.com) offers a revamped site for tracking down whatever ails you. In

If you truly
have the calling,
do not give up.

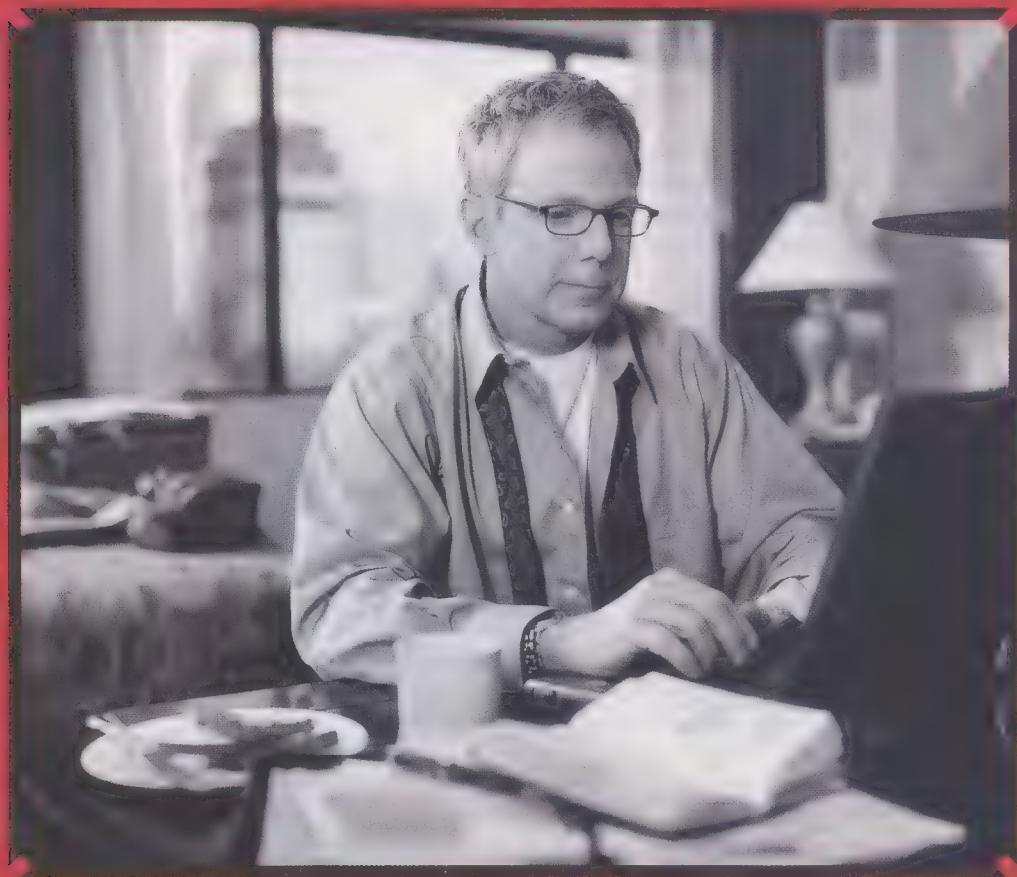
choosing among the vast resources available, look for sites with current postings and an active forums section with discussions at your current knowledge level. If the last post is an apology for a lack of posts, and that post is more than a year old, keep looking. Once you think you are onto something juicy, do a "link:siteURL" Google search to get an idea of which other developer sites link to it, an indication of the value of the info contained therein. Warning: Look closely at the Terms of Use agreements on sites that offer free downloads—they can be just as restrictive as commercial sites.

Finally, keep in mind that most working game developers don't have time to write nifty Web sites dedicated to teaching you how to make games, but many do post their .plan updates regularly. While some developers use the space to be famous, many are willing to share their current game dev issues/solutions quite generously. The .plan tracker on WebDog.org will keep you abreast of your fave developer's personal ramblings. WebDog is, oddly enough, a Blue's News publication. ■

Send your FORTRAN jokes to joan@cpumag.com

CHECK IN FROM THE COMFORT OF YOUR VERY OWN SCHEDULE.

Print your boarding pass at nwa.com/Check-In from almost anywhere.
As the first major network carrier to offer internet check-in, we've made flying easier
and more convenient than ever. Visit us for details at www.nwa.com/checkin



Road Warrior

**Good Names & Technology,
Merger Island, Tunes Via Phone
& More From The Mobile Front**

Radio's A Phone Call Away

Ever wonder why a so-called buddy won't hold his phone to the radio so you can listen on your cell phone while waiting for a flight? Us neither, but that hasn't stopped the Mobile Broadcast Network (www.mymbn.com) from offering to be the friend you never knew you needed. The service provides streaming audio content to any mobile phone for a monthly fee.

If your phone doesn't have wireless Internet access or your data connection is too slow to stream audio, you can use Mobile Broadcast Network's dial-in service. The Dial-in service "streams" audio over your phone's voice channel. Dial-in plans are priced to take advantage of different calling plans. If you have free nationwide long distance, you can dial in for \$5.95 a month. If not, a \$9.95 dial-in plan can provide you with a toll-free number. An Internet plan is available for \$5.95 a month. Both \$5.95 plans feature unlimited access, but the 800 service costs 5 cents a minute beyond your first 100 minutes.

MBN offers content in seven categories, including Music, News, Sports, Religion, International, Horoscopes, and Entertainment. If you find a station you like, you can set it as a preset so you can quickly return to it the next time you log in.

If you're looking for a service with more content, give us a call. We're more expensive, but we'll hold the phone to the radio while you listen to whatever you want. ▲

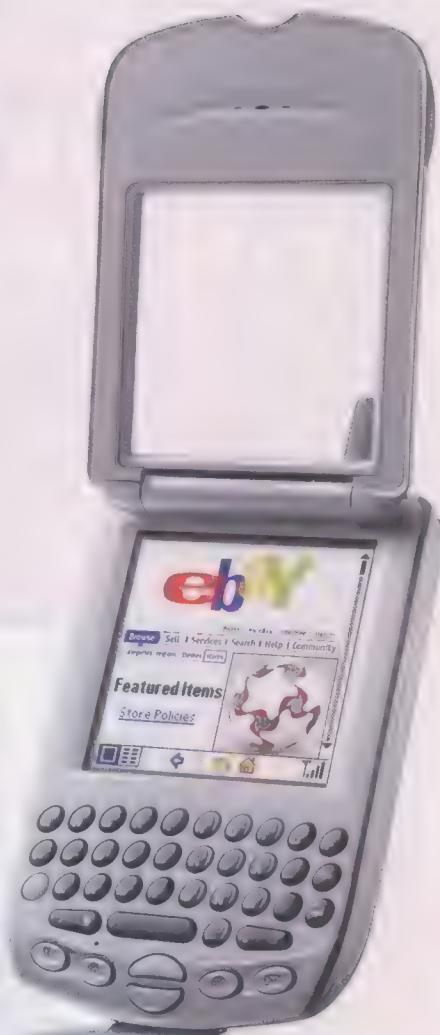
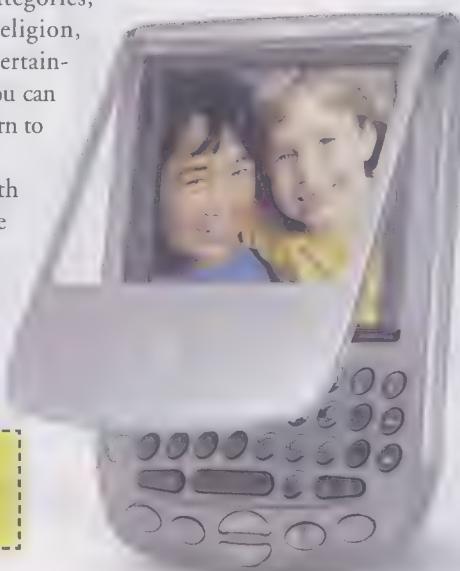
The Handspring Treo 90 lacks wireless capabilities but includes a color display and an SD slot.

Dos Treos

In May, Handspring (www.handspring.com) introduced the Treo 270, a color version of the Treo 180. Like the Treo 180, the Treo 270 provides wireless data and voice over GSM 900/1900 networks. A 12-bit display provides a smaller color palette than 16-bit displays that Palm, Sony, and HP/Compaq use, but in most instances, you shouldn't notice much of a difference.

Graffiti fans waiting for a color Treo will be disappointed. Although Handspring's Treo 180g replaces the small keyboard used for data entry with a Graffiti writing area, there is no graffiti-based version of the Treo 270. Smaller keyboards similar to the Treo 270's are becoming increasingly popular.

Handsprint has also released the Treo 90, which looks similar to the Treo 270



Handspring's Treo 270 adds a splash of color to the original Treo design, but the new communicator lacks handwriting recognition and relies solely on a keyboard for data entry.

with a keyboard for data input and a 12-bit display. The Treo 90, however, is not wirelessly enabled. Unlike the two former Treos, the Treo 90 offers a SD slot for storage expansion. The slot, however, is not SDIO-compatible, so forget about adding hardware via the SD slot. Handspring does claim it might enable SDIO later with a software upgrade. ▲

I Need A Proper Noun

It's likely that whoever came up with the name "Good Technology" was a Mad Lib fan. No matter what, the company's name sounds good (extra credit if you got that pun), even when we press types write mundane sentences such as "GoodLink software from Good Technology. . . ." We'll try to avoid the temptation of using one of the endless number of puns and concentrate on the straight 411.

Good Technology (www.good.com) is attempting to take on RIM by providing a wireless-messaging service aimed at corporations. The company's GoodLink software maintains wireless synchronization with a user's Microsoft Outlook information. Changes on a handheld are reflected on the desktop without having to return to the office to sync the device. You can install the software alongside the company's Microsoft Exchange Server, eliminating the need to install software on each user's desktop. GoodInfo is similar software that provides mobile users with Web-based info.



Good Technology's G100 (right) is expected sometime this summer. Until then, the company's GoodLink and GoodInfo apps will run on RIM BlackBerry devices, such as the one on the left.

GoodLink is now available for RIM handhelds and is scheduled to be available on Good handhelds this summer. Pricing for GoodLink Server is \$3,000, plus \$50 per seat, with an 18% annual support contract. Monthly GoodLink service is \$44.99. A Good company rep says the company plans to port the software to other platforms, including the Palm i705, but there's no firm timeline. GoodInfo should be available sometime this summer.

The company's G100 hardware will look similar to BlackBerry devices, with a high-resolution display and keyboard. The device will measure 3.9 inches high x 2.8 inches wide x 0.6 inches deep and weigh 4.6 ounces. Pricing wasn't available at press time, but to compare, a RIM 957 sells for about \$500. ▲

Love & Mergers

We thought Mike Tyson taking a chunk out of Evander Holyfield's ear was bad. Little did we know that the HP-Compaq merger battle would dwarf Iron Mike's foray into cannibalism. The merger battle is finally over, and it looks like these crazy companies will get hitched despite objections.

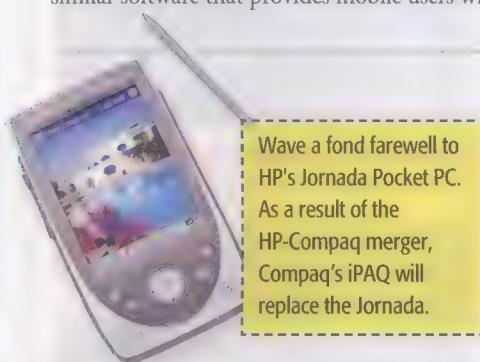
That means it's time to play "Survivor" with each company's existing product line-ups. First off the island is the HP (www.hp.com) Jornada brand, which will be phased out during this year. On the boat right behind it is HP's Omnibook brand, which will also be phased out this year. HP will continue to offer the Pavilion brand, as well as Compaq's (www.compaq.com) iPAQ BlackBerry devices under the HP name.

The decision to use the popular iPAQ brand isn't much of a surprise, as the device has been among the market's most popular. However, the move did surprise some, what with rumors of a new HP Jornada rampant on Pocket PC forums. We'll admit, HP iPAQ just doesn't have the same ring to it. ▲

Tablet PCs In Motion

In May 2002, Motion Computing (www.motioncomputing.com)—a new startup former employees of Dell, Compaq, and Fujitsu founded—announced its intention to build tablet PCs based on Microsoft Windows XP Tablet Edition. Although the tablets will run a special version of XP, Motion Computing makes it clear this will be a fully functional version of Windows, not a stripped-down version. WinXP Tablet Edition will run current and future Windows apps, but it will be able to utilize touch-screen displays instead of a keyboard and mouse. Motion Computing also plans to include audio-input capabilities.

The company plans to market its tablet PCs to "vertical enterprises," or in other words, the devices will probably be expensive and narrowly targeted, so forget about getting your hands on one anytime soon. Specific industries that Motion has targeted include healthcare, insurance, real estate, and government. Motion doesn't have firm information about product availability. ▲



Bluetooth Printing

Bluetooth has had a rough time of late, and the advent of 802.11b has caused some serious confusion over what Bluetooth's role is. We think of Bluetooth mostly as a cable-replacement technology. For example, you could tame that bird's nest of wires behind your computer using Bluetooth to connect certain peripherals, such as PDAs, scanners, and printers.

To help with the printer side, 3Com (www.3com.com) has released a Bluetooth Printing Kit (\$250) that contains one USB Bluetooth adapter and one parallel port Bluetooth adapter. Using the adapters, you can wirelessly connect your desktop to a printer with a parallel port. Once you've installed a Bluetooth adapter on your printer, you can print using other Bluetooth-enabled devices, including notebooks and PDAs. ▲

At Your Leisure

Compiled by Samit G. Choudhuri & Chris Trumble



Plug In, Sit Back & Fire Away

The entertainment world, at least where it pertains to technology, morphs, twists, turns, and fires so fast it's hard to keep up. But that's exactly why we love it. For the lowdown on the latest in game consoles, games, PCs, DVDs, and just stuff we love, read on.

Medal Of Honor Frontline Help Smash Hitler Now!

With a few notable exceptions (especially Halo on the Xbox), console FPS games have in general been average at best. There has always seemed to be a compromise between good graphics and smooth frame rates; games that bridged that gap usually had uninteresting stories, wretched control, or both. Medal Of Honor Frontline rises above these problems, giving gamers the best PS2 FPS yet, bar none.

MOHF isn't quite as gorgeous as Medal Of Honor Allied Assault on a high-end



Get some last-minute advice from the captain before you hit the beach.

PC, but it still looks fantastic. Buildings, soldiers, vehicles, and weapons are all crisp and lifelike, and MOHF manages to cruise along with a modest but steady frame rate. Music and sound effects blend in just the right quantities, giving the game an amazing atmosphere. The shouts of your allies and German soldiers and officers and the

sounds of weapons fire and planes passing overhead quickly transport you to 1944 and put you in the middle of the action.

Your character, James Patterson, is a lieutenant in the Air Transport Corps and a veritable one-man army. In just the first three missions, you'll fight your way up treacherous Normandy Beach (a scene borrowed, with a few tweaks, from Allied Assault), engage in running firefights from doorway to doorway in a shattered French village, and take on a solo mission to put a Nazi sub out of commission. Your tools will include the M-1 Garand rifle, a Colt .45 automatic pistol, and a variety of other flawlessly reproduced vintage weapons. The



This is probably a good time to find some cover.

game's multiple difficulty levels help suit the game to your ability, making it accessible to newbies and hardcore gamers alike.

Medal Of Honor Frontline (PS2)

\$49.99

EA Games

www.ea.com/eagames

Check These Out On The Web

See our reviews of Way Of The Samurai (PS2) and The Italian Job (PS) at www.smartcomputing.com/cpumag/aug02/gamereviews.



Set in Japan circa 1878, Barn! Entertainment's **Way Of The Samurai** puts you smack in the middle of a power struggle between feudal lords.

Rockstar Games' **The Italian Job** is based on the 1969 Michael Caine caper film of the same name.



Deus Ex: The Conspiracy You're The Man

Eidos' recent port of its PC hit Deus Ex from summer 2000 is good news for PS2 gamers looking for involved storylines and depth. You play as J.C. Denton, a cybernetically enhanced agent of a U.N. anti-terrorist unit. Your older brother Paul was the unit's prototype nanotech warrior, and you follow in his footsteps, only to find that things may not be exactly as they seem.

Your agency is stretched to its limits fighting the terrorist tactics of the NSF, an organization committed to righting the wrongs of a government it feels has ceased to act in the people's best interest. The big sticking point is the mysterious substance Ambrosia, rumored to be a cure for the plague known as the Gray Death, which is sweeping through the world's population.

The NSF believes the U.S. government and the wealthy elite are keeping Ambrosia for themselves, leaving the rank and file to twist in the wind. There are two sides to every story, of course, and half the fun of Deus Ex is hearing them both.

This FPS game is action-packed, but it's just as important to pay attention to what's going on around you as it is to hone your combat skills. DETC gives you lethal and nonlethal means to remove enemies from your path, and the game's cast of characters will react differently to you based on the methods you employ most often.

DETC froze up on us a couple of times, forcing us to reset, and its graphics look somewhat dated compared to recent PS2 fare. But its engrossing plot development, a



J.C. gets ready to pump a few rounds into a guard 'bot.

steady stream of nanotech upgrades, and the joy of choosing our own style of play kept us coming back for more.

Deus Ex: The Conspiracy (PS2)

\$49.99

Eidos

www.eidosinteractive.com

The Operative: No One Lives Forever Come For The Action, Stay For The Laughs



These fez-wearing baddies are sarcastic and unfriendly but easy to dispatch.

This year has been a good one so far for PS2-owning PC port fans. The Operative: No One Lives Forever is an FPS molded in the spirit of our time's greatest super spy, James Bond. NOLF's heroine, Cate Archer, is a circa-1960s British thief who has turned over a new leaf and put her talents to work for UNITY, an international organization that fights terrorism around the globe. She battles the nefarious operatives of H.A.R.M., a shadowy

cadre of bad folks who delight in doing bad things.

Cate Archer is UNITY's first female agent, and as the game begins, you find out she's become bored of paying her dues by participating in surveillance ops and running wiretaps. She quickly gets her chance to get into the action, however, thanks to a string of assassinations carried out by the evil Dmitrij Volkov, who has ruthlessly eliminated more than half of UNITY's field operatives in the span of a few days.

Missions start out fairly simple in nature, mostly requiring good small-arms

combat skills, but quickly get more complex. Eventually, you'll have all sorts of cool gadgets at your disposal, including explosive lipstick, perfume sleeping gas, and pen darts. The game's graphics and control can't match those of some recent PS2 FPS games (see the Medal Of Honor review above), but they are adequate as a vehicle for its storyline and the hilarious dialogue you'll encounter along the way.

Cate's witty banter and the conversations you hear in the periphery serve as effective comic relief, and if you keep your ears open, you'll hear her enemies carry on exchanges worthy of Dr. Evil's own outrageous henchmen. There aren't many games amusing enough to make us laugh out loud, but this one does, and that's what really makes this game worthwhile.

The Operative: No One Lives Forever (PS2)

\$49.99

Sierra Entertainment

noonelivesforever.sierra.com



When flight safety demonstrations go bad.

Freedom Force

Wiggle Back Into Your Spandex Briefs

Think about it: A solid superhero game for the PC has been a long time coming. You've heard of many potentially brilliant titles since 1990, but all have turned into vaporware. Remember Hero Software's Champions, MicroProse's Agents Of Justice, and Bullfrog's The Indestructibles? All were hyped, but none made it past the development cycle. Sure, the Spiderman movie-based game from Activision is surprisingly good. However, it lacks the depth and scope of EA's Freedom Force.

The premise of Freedom Force focuses on Energy-X (a mutagen brought to Earth from a different dimension), which drastically mutates humans. As you may have surmised, Energy-X is responsible for the transformation of humans to superheroes and supervillains. Irrational Games (the folks who developed 1999's System Shock 2) has



Just like a page straight out of the comics: Your superheroes take on the bad guys.

given us a game with a feel on par with television's "Justice League" superhero cartoon. Freedom Force plays as a squad-based RTS game (in some way similar to Bullfrog's Syndicate), but with classic comic book-style, all-American superhero attitude.

Individual strengths and vulnerabilities are based on each character's skills, powers,

and attributes. Some characters can fly, others can leap buildings in a single bound, some are resistant to the cold, and yet others have psychic powers. Along the way you'll gain prestige points, be able to recruit other superheroes to your cause, and choose the ones you want on particular missions.

The game is alive with humor, action, and strategy. It's never boring to have one of your characters rip a light pole out of the ground and swing it at enemies, pick up and throw cars, or pummel buildings and walls to dust. The graphics are not extraordinary, but they fit the comic book style of the game well. The campy audio is good, and the character and narrator voice-overs brought on many a laugh. If you've ever wanted to play the superhero, now's your chance.

Freedom Force (PC)

\$39.95

EA Games

www.myfreedomforce.com

Grand Theft Auto III

It's Sooo Good To Be Bad

On page 91 of the April *CPU*, we applauded the gameplay of GTAIII on the PS2 (www.smartcomputing.com/cpumag/apr02/games). Although Sony tied up the console rights for GTAIII until October 2004, PC gamers can rejoice:

DVD Byte by Todd Doogan

"Pearl Harbor" isn't a great film, but you have to admit the beautiful and well-coordinated pyrotechnic violence sucks you in during the attack sequence. And isn't that the whole reason they made the film? This director's cut in no way replaces the earlier edition



of the film; this version has touches of violence that couldn't be shown with the PG-13 rating needed to make back the \$150 million the movie cost to make. Filled to the digital brim with incredible behind-the-scenes footage, interviews, and information, plus hours of preproduction



concepts and historical documentaries about the true events that inspired the film, this is the most in-depth look at a film we've had on any home video format. Packaged in a replica of a soldier's war journal for about \$25 online (\$10 rebate available), this one's pretty much a no-brainer. Check this disc out.

loved the radio stations in the original, but the PC lets you blend in MP3s for custom radio stations. And you can now change the player skin.

If you're running WinXP and find a graphic glitch with missing text blocks, you may need the patch at www.microsoft.com



Chinatown, Liberty City. You'll soon learn that the Triads have no love for you here.

Downloads/Release.asp?ReleaseID=37942. Download the patch, reboot, and then indulge your senses in what may end up being the best PC game of 2002.

Grand Theft Auto III (PC)

\$49.99

Take-Two Interactive Software

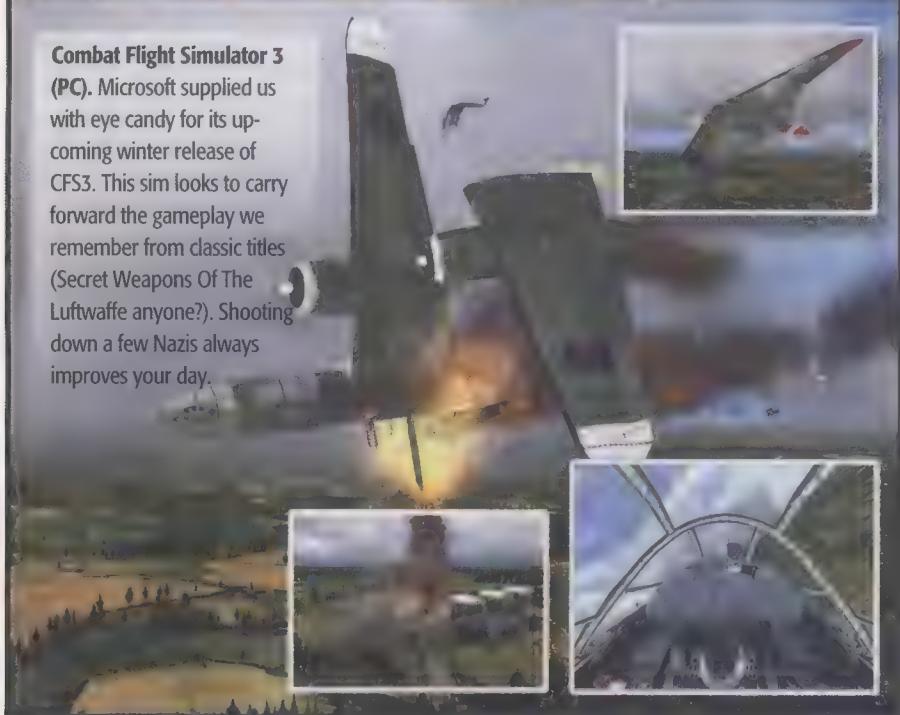
www.grandtheftauto3.com

Hot Shots: The Beauty Of The Game

Yeah, we know it's all about the gameplay. Games such as Dune 2, Command & Conquer, WarCraft, StarCraft, Myth, F-15 Strike Eagle, Jet, Flight Simulator, Red Baron, Secret Weapons Of The Luftwaffe, Aces Of The Pacific, and F-117A Stealth Fighter (to name a few) were brilliant in their time. But now it's time for a whole new breed of RTS and simulators. Let's take a look, shall we?



Combat Flight Simulator 3 (PC). Microsoft supplied us with eye candy for its upcoming winter release of CFS3. This sim looks to carry forward the gameplay we remember from classic titles (Secret Weapons Of The Luftwaffe anyone?). Shooting down a few Nazis always improves your day.



Command & Conquer Generals (PC). Step forward into the future when the United States, China, and the Global Liberation Army fight for their individual visions. This is the first time the Command & Conquer world enters the realm of 3D, and it looks bloody excellent (as you see from the in-game screenshots). Unlike the fantasy worlds of C&C, you will find familiar units, weapons, and other tools of warfare to combat the enemy. Good luck, General.

Infinite Loop

Alright, Already, Just Quit Bugging Me, OK?

Research shows that about 86% of children under 18 who buy computer games actually get their parents' permission before purchasing a game and 91% have their parents present at the time of purchase. Yet, 90% of kids ranging in age from 8 to 11 claim their parents never check the ratings of the games they play. It appears parents are making their purchase decisions based on something other than the ratings guidelines found on game packaging.

Source: Cyber Atlas, "Games People Play" by Robyn Greenspan



SOFTWARE TIPS & PROJECTS

PC ER: Boot To CD

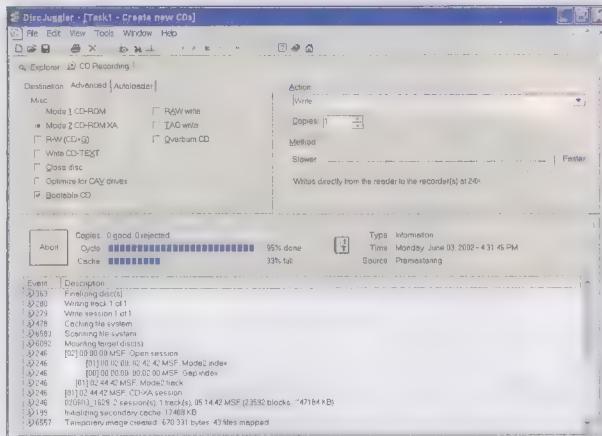
THERE IS SO MUCH MORE TO DO WITH A CD-R/RW DRIVE THAN RIP MUSIC AND STORE ALL OF YOUR JPEGs OF TARA REID . . . ER, WE MEAN, BACK

up all those vital data files. This month we explore a road less traveled with most disc burners: making a bootable rescue CD.

Floppies are out. Combined with most recent PC motherboard/BIOS combos, a CD-R/RW drive can do pretty much everything a 1.44MB drive can do, including boot the machine. Windows XP itself and most antivirus and system repair utilities now come on bootable CD-ROMs. Why would you want to make your own? Well, as anyone who has tried to put together a rescue floppy knows, the main advantage of booting to a CD is space, having enough room to plant all of the DOS utilities and emergency rescue and repair programs you would need on a single disc.

Before you start writing discs for this project, first you must tinker with the BIOS setup so the PC will know to look for your bootable CD. Our WinXP test machine runs an AMD 1.4GHz processor with 256KB RAM on a Gigabyte motherboard with Award BIOS. Most Award BIOS setup screens store the boot options under the Advanced Features category. Here, the First Boot Device is Floppy by default, but you need to set it to CD-ROM. With your Second Boot Device set to HD, the system now looks for a bootable disc in any available CD-ROM.

drives before going to the hard drive to start the PC. Our test system had a DVD-ROM drive as master on the secondary IDE channel and the CD-RW drive set as slave, but the machine recognized a bootable CD in either drive.



Most of the major CD-writing software titles now include options for making a bootable CD. In DiscJuggler, make sure you check the Bootable CD checkbox in the Advanced tab of a CD recording project.

Floppy First

Next you need to make a bootable 1.44MB floppy, which your CD writer software is going to turn into the "boot image" for the CD. In the past, home hackers used a variety of freeware tools to create these "image files" and then used hex editors to tweak the code in order to make them CD-bootable. Nowadays, most recent versions of the major CD writing software titles (such as Roxio CD

Creator, Nero, and DiscJuggler) will make and burn these images for you. The boot floppy is key, then, because your CD is going to boot in precisely the same way as that floppy boot disk you are creating first: the same basic OS command files with the same device drivers and configuration files loaded. It is critical to think ahead when making and testing this floppy disk before burning it onto the CD.

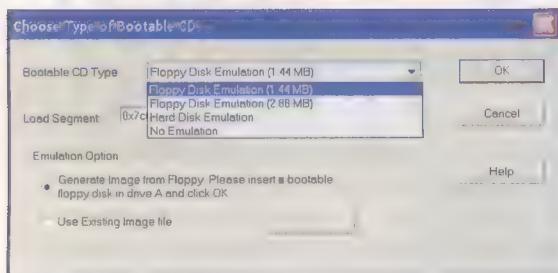
When a PC boots from a CD-ROM drive, it only reads the boot image from that disc; it does not actually mount or load the drive so that it can be used in other ways. Thus, it is vital that all

the necessary CD-ROM device drivers are included in the root directory of this initial floppy and that they are loaded correctly in the Config.sys and Autoexec.bat files. You can take the easy way out by simply making a WinMe or Win98 startup floppy disk (use the Add/Remove Programs dialog box and the Startup Disk tab), which automatically plants and configures universal CD-ROM drivers on the boot floppy.

Users of earlier Windows versions will need to load the appropriate driver for their CD-ROM device in the Config.sys file and pair it with the DOS MSCDEX.exe program, which is

loaded in the Autoexec.bat file. Test this out on the bootable floppy to make sure that the CD-ROM drivers are loading properly. If you want to use this boot CD as a rescue disc on multiple machines, a sort of MASH unit for any PC, the best bet is to use a startup disc with universal CD-ROM drivers.

Two caveats about the boot floppy: Because booting from a CD can change around a PC's drive letters, there should be no command lines in either the



In Floppy Disk Emulation mode, your CD will mimic precisely a floppy disk's boot sequence. Roxio's CD Creator creates a boot image from a bootable floppy that you provide.

Config.sys or Autoexec.bat files that specify a drive letter. For instance, avoid a line such as "device=b:/plextorcd.sys," because what may be the B: drive in a floppy boot will not be in a CD boot. The best policy is to put all of the essential drivers and programs that need to be loaded at boot into the root directory of this floppy and then eliminate any path names in the command lines. And because the CD-ROM is not writeable, you want to make sure that no devices or programs that you load try to write

a basic menu system. It prompts you at boot about whether to load the CD-ROM drivers. Users can modify this menu system and add new device options.

Once the boot floppy is set in stone and tested, it is time to assemble your boot CD. We used the ubiquitous Roxio CD Creator 5. With the bootable floppy you just made in its drive, start a new project and choose Bootable CD from the menu. A pop-up box lets you declare that this is a Floppy Disk Emulation project, which means that

the CD will imitate a floppy disk at start. When the image is finished, the writer program creates the two files necessary for booting a CD: Bootcat.bin and Bootimg.bin. At this point you can burn the disc and have a bootable CD with all of the files that had been on the floppy startup disk.

Pile It On

Pretty cool, but the real beauty of a bootable CD is being able to pack into it more than any reasonable stack of floppies can handle. For instance, if this CD is going to be a rescue disc of some kind, you will want the full range of DOS programs at your disposal. More advanced commands, such as Xcopy, Deltree, Edit, Scanreg, and Scandisk, are all indispensable for most repair and rescue operations, but they aren't installed automatically when WinMe/98 makes a startup disk. In most Windows versions before XP, you can find all of these files in the WINDOWS\COMMAND subdirectory. WinXP does not have any DOS command files available, so you will need to scavenge these files from an older Windows installation. For DOS-like repair and rescue functionality in XP, see the "XP's Recovery Room" sidebar.

We instructed CD Creator to add the entire WINDOWS\COMMAND subdirectory to our project. In this same way, you can add most DOS-based programs, such as virus scanners and hard drive or system repair utilities. Again, you want to make sure your programs are not going to try to write back onto themselves. Make sure you have a basic text editor and a decompression program, such as PKZIP, on any rescue CD. You can also make a subdirectory on the CD to store compressed shareware programs that you can then install onto any system's hard drive later. If you can find DOS-based drivers for your mouse, these too are worth loading into the root directory and your boot configuration.

Most of the major system maintenance suites from manufacturers, such as Norton and McAfee, have DOS-based executables that are designed to work well from a boot floppy or CD, and these are

WinXP Tip Of The Month

XP's Recovery Room

Unlike previous versions of Windows, XP will not boot into DOS mode or even make a DOS-based startup disk for you. So what do you do when XP won't start in native or safe modes? You go to the Recovery Console. Say what? Nobody told us about any Recovery Console. In fact, the RC is a kinda, sorta DOS-like command-line program that you can boot into when all else fails. It is an option when you boot XP from its CD, but you can make it available anytime by installing it to the hard drive, which makes the Recovery Console one of

the options when booting into XP.

Put your XP installation disc in the CD drive and exit the installation splash screen if it comes up. Click Run from the Start menu and type [your CD drive letter]:\i386\winnt32.exe /cmdcons in the dialog box. Acknowledge all of the installation screens to install the program.

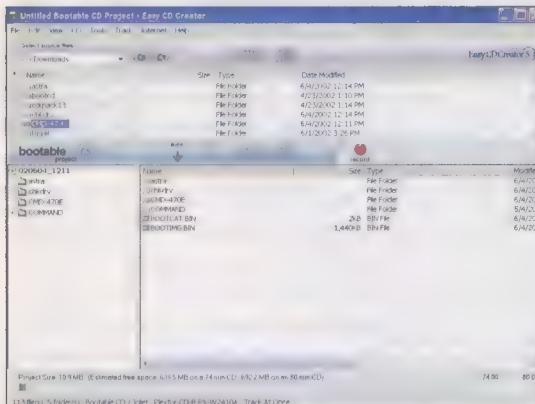
When you reboot, a Recovery Console option will appear after the BIOS screen, or it will be added to your boot options screen if you have multiple boot partitions. The RC launches itself and asks you to choose a Windows

installation. Unless you have multiple instances of XP on different partitions and drives, you should have only one choice to make here. The RC requires that you have Administrator access, so it asks for a password. If you never set one in WinXP, press ENTER. This will plant you into the WINDOWS directory. Type help to get a list of available commands, which include many DOS favorites, as well as utilities for fixing your hard drives and making and removing partitions. ▲

prime candidates for including on your CD. Unlike Windows programs, which plant DLLs and other pieces of themselves throughout the Windows system directories, most DOS programs keep all of the code needed for them to run within their own subdirectories. You will need to experiment a bit to see what runs well straight from its own directory, but in most cases, we were able to transfer these DOS programs onto the bootable CD simply by dragging and dropping its subdirectory into the CD project. For instance, we found a system information program (Astra), an older version of McAfee VirusScan, and a drive diagnostics program (Chkdrive) at CNET's Download.com. In each case, we downloaded the compressed file, uncompressed it to a subdirectory on the hard drive, and then added that subdirectory to the CD project in CD Creator. Like any CD project, the final stage is burning the disc.

Test Your Handiwork

If the BIOS is set to boot from the CD, and the disc itself was written properly, your PC will tell you that it is booting from the CD after the initial BIOS screens come up. In our case, the CD loaded



Once the boot sectors have been established for the CD, you can copy virtually any DOS executables or compressed files to your CD for use on an ailing PC.

exactly as if it were our original WinMe startup floppy, including the Start menu that asked whether to load the CD-ROM drivers. There were some key differences between this and a floppy boot, however, and all of them

Registry Hacks Of The Month

Launch It Your Way

Most of us complain that Windows loads too many programs at startup, but what if you want certain programs to be up and running whenever you boot Windows? In most versions of the OS, you can go into the Registry Editor and find `HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Run`. Right-click any blank space in the right pane and choose New, String Value from the pop-up box, then type in a name for the Program you want to launch. Right-click this

newly made key and choose Modify to open the Edit String dialog box. In the Value Data box, type in the full path to the program that will load at start-up. For instance, we wanted MusicMatch Jukebox to run whenever we started Windows. So we used MusicMatch as our String Value and typed **D:\PROGRAM FILES\MUSIC-MATCH\MUSICMATCH JUKEBOX\mmjb.exe** in the Value Data box.

Registry Bookmarks

Tinkering with the Registry often requires several return trips to the

same key. Rather than drill down through that massive tree in search of your favorite settings, you can bookmark any spot in the Registry just as you do Web pages in IE by using (you guessed it) the Favorites menu. Go to the point in the Registry tree you want to mark and highlight the key in the left pane. Open the Favorites menu and choose (right again) Add To Favorites. A shortcut to the key will be added to the bottom of the Favorites menu, and your key will be added as a menu choice to the bottom of the Favorites menu. ▲

are positive. First, the CD is much faster. Although a standard floppy takes as long as a minute to load DOS into memory, our boot CD took less than

Everything from the original boot floppy, which CD Creator converted into a bootable image file for us, was now present as the A: drive. It is important to remember that A: is not the CD-ROM itself but essentially a virtual drive containing only the boot image files from the CD. The universal CD-ROM device drivers mounted our CD as the G: drive, and that is what gives us access to the rest of our burned CD. At the

G: prompt, we could navigate our boot CD and run all of the DOS programs we installed from their respective subdirectories.

In the end, we assembled a hefty PC tool kit on a single CD. It should

be bootable on most contemporary machines, and it has many of the basic tools necessary to troubleshoot an ailing PC. All of which means it may be time to retire that floppy. **cou**

by Steve Smith

Infinite Loop

When I Said Someone Should Pay, I Meant The Other Guy

A recent study from the Business Software Alliance showed that although 95% of Internet users believe software programmers should be paid for their work, 60% of users rarely pay for copyrighted programs, and 12% admit outright that they simply steal

easy-to-get
online
goodies

WHAT'S YOUR BURNING DESIRE?

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 DVD-R. Only DVD Forum approved formats

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AUDIO



IMAGES

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DVD-GPU

WARM UP TO PENGUINS

Get Up To Speed With Your Command History

IN JULY'S ISSUE OF COMPUTER POWER USER, WE PRESENTED TIPS FOR CUSTOMIZING THE COMMAND LINE LOGIN. THIS MONTH, AND IN MONTHS TO COME, WE DELVE INTO MORE

Linux issues and projects. This month, we focus on working with your command history.

After you work on the Linux command line long enough, you'll notice you often end up typing the same things over and over. What is even worse is that some of these commands are long and complicated, perhaps containing paths and filenames you have spent significant time tracking down. One way to avoid duplicating your efforts is using a bash shell feature called the command history.

Get Started With History in Bash

Every time you press ENTER at the Linux command line, bash stores what you've just typed in a special history file that's named `.bash_history` (notice the starting period), which is stored within your home directory. Use the command `ls -la ~ | more` to ensure this file indeed exists in your home directory. If it doesn't exist there, you will need to create it by typing `touch ~/.bash_history`. You will then need to change its permissions so only you can read or write to this file by typing `chmod 600 ~/.bash_history`.

Once you have your history file at hand, you need to ensure it is storing as much or as little information as you would like. To see just how much your particular distribution has set the history to save, you can type `echo $HISTSIZE`. The default value in bash is 500, but many distributions and individuals prefer to save the last 1,000 commands they have typed. If you have great concerns

about other users possibly peeking into what you have been doing, you might find it useful to actually set this number less than 500.

To set a new value for how many commands you want to have saved, type `HISTSIZE=value`, where `value` is the new number of commands you want to save. For example, if your current `HISTSIZE` setting is set at 500 and you want to save the last 1,500 commands you have entered from now on, you would type `HISTSIZE=1500`. Keep in mind that if you perform this action right now, your history file is still going to only have 500 commands in it until the next command you type. Then the file will have 501, 502, and so on, until it reaches 1,500 commands. If you reduce the number of commands you want to store in the file, the appropriate number of the oldest commands will be deleted from the file right away. So, if you were going to move from saving 500 commands to only 200 commands, the first 300 entries would be deleted from the file.

Command History Basics

You can use a number of basic methods to access your command history, including reusing a command you have recently typed. In addition, you can cycle through your entire command history using the Up and Down arrow keys on your keyboard or `CTRL-P` and `CTRL-N`. You can even look directly in `~/.bash_history`.

Various important characters and commands can be helpful when dealing with

the command history. Go to your Linux box's command prompt and just type `history`. This action gets you the entire contents of `~/.bash_history`, with each command assigned a specific number based on the order in which it was used. To experiment, choose a command from the list that is pretty harmless, such as `ls`, and take note of its number. For example, perhaps typing `history` got us a list that includes this section:

302 cd ~
303 ls -l
304 less .bash_history

You can reuse any command by making use of its index number in the history list and the exclamation point, otherwise known as "bang" in the programming and Unix worlds. So, we might choose item 303 to experiment with because no matter where we are on the system, it won't cause any harm. To rerun command 303, we would type `!303`. Note that this action doesn't run any other commands other than 303, so we may be anywhere in the file system at the moment.

Some other handy shortcuts you can utilize include the following:

- `!-#`, where `#` is the number of commands you want to back up from the last command you typed. You can also use `!!` instead of `!-1` to repeat the last command.
- `ESC-<` to call up the first entry in your history file.
- `ESC->` to call up the last entry in your history file.
- `ESC-CTRL-y` to call up the first argument for the previous command. For example, if you had just typed `less ~/journal/Weds`, pressing `ESC-CTRL-y` would insert `~/journal/Weds` at your cursor location.
- `ESC-.` to call up the last argument for the previous command.



- **CTRL-o** to run the command you just finished typing. Look in the history file for the last time you ran this command, and then put the command you typed directly after this one as the next item on the command line. For example, say that 200 commands earlier you typed `cat /etc/passwd | grep nologin`, pressed ENTER, and after reading the results of the search, typed `vi /etc/passwd` and edited the file. You haven't typed `cat /etc/passwd | grep nologin` since then. Now, you could type `cat /etc/passwd | grep nologin` and press **CTRL-o** and the shell would run the command for you and then place `vi /etc/passwd` at the command prompt for you.

```
[root@localhost root]# ls *g
0519203921.log anaconda-ks.cfg install.log install.log.syslog minicom.log
[root@localhost root]# head -2 install.log
Installing 811 packages

[root@localhost root]# !!
head -2 install.log
Installing 811 packages

[root@localhost root]# "head"tail"
tail -2 install.log
Installing plugger-4.0-6.
Installing libesxtip-devel-0.8.4-2.
[root@localhost root]# !ls
ls
0519203921.log anaconda-ks.cfg install.log install.log.syslog minicom.log
[root@localhost root]# !head?
head -2 install.log
Installing 811 packages
[root@localhost root]#
```

There are numerous methods (including using shortcuts) of working with command history. In the example here, commands are reused and even altered in various ways.

More Command History Tactics

There is even more to command history. For example, like the exclamation point that precedes quite a number of items, additional tools are available, as well. One of the more useful history functions is used in the format `!command`, where `command` is the first word in a command series you typed earlier.

Let's say you are working with a series of CDs, but you aren't working with them in a way that they are automatically mounted for you. You find yourself continually typing `mount /mnt/cdrom`, then `cd /mnt/cdrom`, progressively working through whatever it is you are doing, and then `cd /` and `umount /mnt/cdrom`. Of course, you can combine some of these with semicolons, using `mount /mnt/cdrom; cd /mnt/cdrom`, and later `cd /; umount /mnt/cdrom`, but you can't combine them beyond that.

You will still have to carry out the process once manually, so the first time you insert one of the CDs, you would type the full command, such as `mount /mnt/cdrom; cd /mnt/cdrom`. The first time you remove the CD from the CD-ROM drive you would type the full command for this process, such as `cd /; umount /mnt/cdrom`. For the next CD, however, as long as you haven't used the mount command again in another way, you could type `!mount` and press ENTER. This action expands the command to `mount /mnt/cdrom; cd /mnt/cdrom`.

The `umount` command would be trickier, however, primarily because you have probably used `cd` again since typing the combined `cd` and `umount` line. All is not

lost, however. You just need to use a different form of the history utilities. In this case, you would type `!umount?` to reuse the `cd /; umount /mnt/cdrom` command sequence, as long as you have not utilized the `umount` command in another form since then.

What if you make a typo? Let's say you attempt to start something else and you type `unmount /mnt/cdrom` instead of `umount`. Here is another quick solution for you. Type `^unmount^umount^` and press ENTER. Lo and behold, the shell runs `umount /mnt/cdrom`.

Moving On

There's more to the history function in the bash shell. If you work primarily on the command line, it's worth looking into these additional features. You can save a lot of time and typing with a little knowledge and some quick keystrokes.

To learn more about command history in bash, type `man bash` to open up the manual page for the entire bash shell. This is a huge document you can learn a lot from reading. For now, skip the next mention of the history command by typing `/history` and pressing ENTER. Skip through the history mentions by pressing `N`. **CPU**

by Dee-Ann LeBlanc

Infinite Loop

There's No "Fast Forward" In Print

Having a hard time finding any content within the pages of your favorite mags? Every other page seems to be an ad for clothing or cars? To determine how much editorial content is actually inside those magazines you buy off the newsstand, we did a quick informal count of ads vs. editorial pages in a few popular pubs. *Full Disclosure: Smart Computing is produced by Sandhills Publishing, publisher of CPU. Our pubs win, of course.*

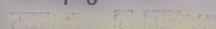
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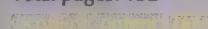
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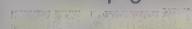
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June 11, 2002, issue • Newsstand cost: \$5.99 • Ad pages: 93 • Editorial pages: 71 • Total pages: 164



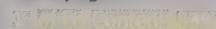
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KILLER HARDWARE TIPS

Too Cool To Follow Rules

IF YOU'RE A USER WHO CAN'T LEAVE THINGS ALONE IF THERE'S A CHANCE YOU CAN MAKE THEM BETTER, EVEN IF IT MEANS BUCKING THE NORM, READ ON. WE HAVE SOME TIPS

and tricks that just might make you more productive.

Modify Your BIOS Boot Logos

You've customized your PC's case and tweaked the OS to your exact specifications. If you think you have personalized everything you can possibly personalize, we ask you: Have you created a custom boot logo yet?

As your PC boots, it probably displays one or two graphics: the Energy Star logo and possibly the manufacturer's logo. These display during the POST (power on self test), which occurs before the PC passes control to the OS. Changing these logos means inserting new graphics into the PC's BIOS. An assortment of software can help do the job.

On PCs with a Phoenix or Award BIOS, the Energy Star logo is stored in a little-used file format called EPA. BMPtoEPA (www.flazh.de) and EPACoder (bios.help.pl/tools/epacoder.html #English) are utilities that can convert BMP graphics to the EPA format. You can create your own Energy Star logo or download one. A library of replacement graphics is available at juggernaut.de/seiten/pcfunk/bios/epadownload.htm.

Once a graphic is in the correct format, you need to flash it into the BIOS. CBROM Repository (www.stormpages.com/crazyape/cbrom.html) and Award-Mod (sourceforge.net/projects/awardmod) are BIOS flashing utilities for systems with Award BIOSes. You'll also need a BIOS

image file, which is a copy of the BIOS for your particular motherboard.

Systems with an AMI BIOS don't use the EPA file format; they use the more common PCX format for a 132-pixel square logo. Use a program called AMIBCP (www.virtual-hideout.net/guides/bios_logo_mods_part2/ambcp.zip) to insert that graphic into your BIOS image file and a utility called FLASH (bios.help.pl/tools/amiflash.html) to flash the modified BIOS image to the motherboard. "Virtual Hideout" is a detailed article on hacking the Energy Star logo on AMI systems available at www.virtual-hideout.net/guides/bios_logo_mods_part2/index.shtml.

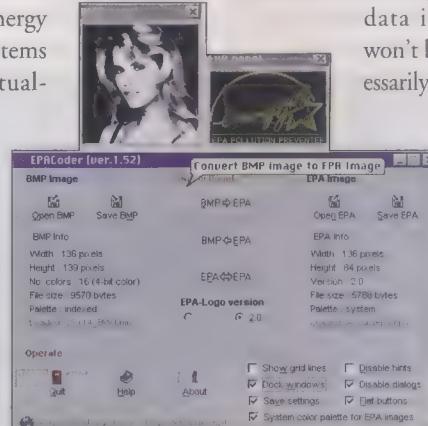
Some Award motherboards do have adverse reactions to certain types of EPA files, mainly the EPA 2.0 format, which many still do not support. This can cause garbage on the screen during boot up but typically doesn't keep the system from running," says Ben Brown, author of the "Virtual Hideout" article. "On the other hand, I've experienced some problems with AMI BIOSes not booting after a nonstandard PCX file was added."

If your flashing program doesn't explicitly support your motherboard and BIOS, don't try to make it work—it could spell disaster. Flashing your PC's BIOS is equivalent to a brain transplant, so take care. Gary Simpson, director of Technology and Strategic Initiatives at Phoenix Technologies, warns against using third-party utilities that modify your BIOS.

"Reprogramming your BIOS just for grins is not recommended," he says. "I would definitely recommend that anyone who is going to do this create a disaster recovery floppy first. The danger here is these utilities are poking around in a binary image and making decisions about what they think they find there. If these programs are looking for an image that they believe is the Energy Star logo and replacing that with something, there is always the chance that they could do something harmful," Simpson says. If the utility overwrites data other than the graphics or moves other

data in the BIOS, the PC won't boot. All hope isn't necessarily lost, however.

"Most machines have a section of the BIOS that is unerasable called the boot block. When you start the machine, the first code that executes is in that boot block section of the flash ROM. It checks the rest of the image in the erasable part of the BIOS to make sure



EPACoder will convert your BMP image to the EPA format, enforcing the strict size limitations on images replacing the Energy Star logo.

that it appears to be a healthy BIOS. If it fails to checksum, it has just enough capability within that boot block to set up the chipset, find the floppy controller, and search for a recovery diskette," says Simpson. The recovery disk is a specially



formatted floppy that includes an image of the BIOS and a utility for copying it back to the flash ROM. If you don't have a recovery disk, the OEM may send you one. "If not, you have a boat anchor."

To reprogram the BIOS, a utility has to turn on the programming voltage to the ROM. A single algorithm to reprogram a flash ROM doesn't work across all motherboards; it depends on the chipset and on individual motherboard design, says Simpson.

Is tweaking the boot logo any more dangerous than flashing a new version of your BIOS? If the software you use to replace the graphic does the job correctly, the risk is the same. That is, it's reasonably safe if the power doesn't go out in the middle of the process.

In addition to the Energy Star logo, many BIOSes support a low-res 640 x 480 OEM logo that may appear at boot time.

"In most motherboards, the OEM logo is easily changed using special software that comes with the motherboard on its CD-ROM," says Gabriel Torres, editor of hardwaresecrets.com. If you don't have the CD, check the motherboard manufacturer's Web site. For example, FIC (www.fica.com) motherboards include software called LogoGenie to customize the boot logo. Amptron offers a BIOS logo editor at www.amptron.com/html/utility.html.

"As far as Award goes, you can add a full-screen logo as a 640 x 480, 16-color BMP file by using the CBROM/LOGO command, though this only works on BIOSes that have full-screen logo capability," says Brown.

The OEM logo is easier to change than the Energy Star logo because it's meant to be changed not by the user but by the company that builds and sells computers. Like the Energy Star graphic, the OEM logo usually lives in the flash ROM and has strict size limitations.

"The manufacturer software automatically converts the file format and checks the size for you," Torres says.

We Destroy CDs So You Don't Have To

Each time you open a case of CD-R or CD-RW discs, you see it: manufacturer precautions. Don't scratch the

disc, no solvents or ballpoint pens, avoid high temperatures, and keep your grubby fingerprints off the media. To most people these things are common sense. To us they are a challenge.

We took six brands of CD-R and CD-RW discs and tortured them to find out just what you really can and can't do to optical media. We used CD-Rs from



These CDs died horrible deaths for the sake of science. Our advice: Coddle CD-Rs as you would a newborn baby.

Memorex, Maxell, and IBM, plus the cheapest CD-R we could find: 4X Imation discs free after a rebate. For CD-RWs, we used generic discs from Sony and Staples.

We started our destruction by simply writing the word "DATA" on each disc's label with a ballpoint pen in quarter-inch high letters. Then we tried to copy all the data from the discs. The results were universally poor. For instance, the Memorex and Maxell CD-Rs gave us some of the data back but choked on many files. The

IBM disc refused to mount at all. Data on a CD-R disc lives just under the top label, so any scratch to the label gouges directly into the data surface.

The discs we tested were more tolerant of scratches on the bottom (nonlabel) side. We raked the business end of a paper clip across six discs and were easily able to recover all the data. The discs didn't fare so well after a six-inch slide down a concrete sidewalk. The bottoms were so badly scratched that none of them would mount.

Next, we turned up the heat by leaving six fresh discs on the dashboard of a car in the Arizona desert all day. The temperature outside the car hit 103 degrees. Inside, it was scorching. At the end of the day, the plastic CD cases were completely warped, but the discs remained flat. Most of the discs worked fine afterwards. The Memorex disc would mount, but we couldn't retrieve any files from it. The Sony CD-RW wouldn't mount in one drive but did work in another.

The moral of the story: CD-R discs are indeed fragile. The warnings are serious. No brand seemed more resilient than the others. If a terrible fate befalls your precious CD, it pays to try extracting the data using multiple drives. We found that when one CD-ROM drive was unable to access any data, another drive was often able to dig out some of the data. **CPU**

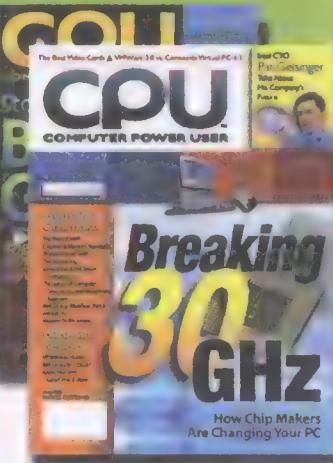
by Kevin Savetz

Infinite Loop

Blame It On George

The release of "Star Wars: Attack of the Clones" had chat rooms and message boards buzzing with anticipation. It also caused a tremendous amount of worker absenteeism on May 16, 2002, the first day the film was released. Just before the film's release, the outplacement firm Challenger, Gray & Christmas estimated that as many as 2.6 million full-time or salaried employees (accounting for 46% of the film's first-day viewers) would miss work on May 16 due to the "Padme Pox," also known as "Skywalking Pneumonia," "Hem-droids," and "Pink Jed-eye."

Challenger, Gray & Christmas estimates the widespread skip day resulted in approximately \$319 million in lost revenue for U.S. businesses. Major metropolitan areas, such as New York City, Chicago, Los Angeles, and San Francisco, were probably the hardest hit. The firm arrived at its estimates based on statistics from the premiere of "Star Wars: The Phantom Menace" and the Bureau of Labor Statistics.



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Technically Speaking

**An Interview With Dr. Kevin C. Kahn,
Intel Fellow, Corporate Technology
Group & Director, Communications
& Interconnect Technology, Intel Labs**



Bluetooth is a great first step in enabling wireless PANs (personal area networks), but let's face it, when transferring DV footage from camera to hard drive or copying gigabytes of data from a notebook to a desktop, your choices are using a wired connection or packing a lunch. Even 802.11b, with its 11Mbps data rate, is still too poky for many bandwidth-hungry apps.

Enter UWB (ultra-wideband), one of the latest technologies to surface from Intel Labs. Officially, ultra-wideband means any wireless scheme that ranges across more than 1.5GHz of the radio spectrum, but in today's computing context, UWB is a fledgling technology that may actually fulfill Bluetooth's empty promise to banish data cables and bring about true PAN computing.

Intel has been key in pushing UWB from a napkin concept through industry approval to product development. Intel Fellow Dr. Kevin C. Kahn is the director, communications and interconnect technology, Intel Labs, which means he leads all Intel's UWB efforts. If your PC is streaming live wireless video to your super-high resolution Web tablet in the near future, Kahn may be one of the people most responsible for the connection. ▲

by William Van Winkle

CPU: UWB was essentially on hold until recently because of a hold up with the FCC. What was the issue there?

Kahn: Well, the FCC says that if you're going to operate a radio transmitter, you're not supposed to generate any intentional noise. Nevertheless, if you put a spectrum analyzer outside the box, you're going to see stuff escape, what with all the high frequency switching going on. There are regulations that basically limit how much emission you can have. The original idea with UWB was to say, "Look, if you're willing to let people who don't intend to emit at those levels, there shouldn't be anything wrong with people intentionally emitting at those levels." So the FCC went down a process to clarify what the rules would be for intentional emitters, radios designed to emit in spectrums that they don't own.

This became very controversial for a number of reasons. Probably the most significant technical reason had to do with GPS. The fear was that if you had radios intentionally emitting partially in the GPS band, this would create interference with GPS signals. But anyone who owns any spectrum, and in particular the Department of Defense, doesn't like anyone stepping inside their band.

What the FCC finally decided was that they would let emissions by intentional emitters in the band ranging from 3.1GHz up to 10.6GHz. The technology is meant for indoor use or outdoor use in devices that are mobile. There are still some details to work out, like defining exactly what "mobile" means, but essentially the FCC said if you stay in that range of 3.1 and up, that'll be fine. There are also provisions for crossing into the GPS and cell phone ranges, although those signals are much more suppressed.

CPU: How does UWB overlay currently occupied RF bands without interfering with them?

Kahn: You could think of UWB as putting out just a whisper. From the perspective of narrowband users, it really just looks like a little bit of noise. I mean our radio systems are built to tolerate a fair

amount of noise and pull a signal out of whatever interference is out there. It's like if you're listening to a lecture and someone next to you turns and whispers in the ear of the person next to him. You may hear it, but it's not likely to disturb you.

Now, you can turn that question around and ask why the UWB signal doesn't get drowned out by all the loud narrowband traffic? It's a bit like error correction. You're essentially correlating the signal over such a huge range of frequencies that even though pieces are being disturbed, you're still able to piece together a coherent signal out of the whole transmission. At any point on the band, there aren't going to be very many bits to disturb.

CPU: Is UWB something of a work-around to the dearth of spectrum the FCC is making available for next-generation, high-speed wireless apps? It sounds like rather than UWB having its own big spectrum yard to play in, it's going to quickly skip through everybody else's.

Kahn: Not really because the data range is so short. I mean, once you get out past about 10 meters, you would be better off with a narrowband system.

CPU: What is the industry's take on UWB at this point?

Kahn: What exists today are a handful of startup-class companies that would love to have product out on the street tomorrow because their funding is limited. You know, it's the usual situation with startups. They're all doing their own thing.

There has begun to be some initial conversation at the IEEE in the 802.15.3 group. 802.15 is the short-range personal area networking group, just like 802.11 is the local-area networking group. The .3 sub group represents a future high-rate version of something. But they've actually started looking at UWB as one of several potential candidate technologies for a high-speed band. But there aren't any sort of formal industry association groups yet. I expect we'll see some proprietary products from some of these startup companies because they're highly motivated to ship

stuff. From the bigger, more traditional players like Intel or Motorola or someone like that, I think it'll be a while longer because we're more interested in trying to get a long-term industry standard set.

CPU: How far has Intel developed UWB?

Kahn: We actually demonstrated a prototype at a recent IDF [Intel Developer Forum] running at 100Mbps. But it's really early. And I think it's also right to say that UWB is not a foregone conclusion as the right next technology. It's certainly a good-looking candidate, but there are some other choices people are considering.

CPU: In short, why do we need UWB?

Kahn: It has the potential to offer hundreds of megabits at PAN-type ranges, say five meters. This is way above what we think we can do with today's narrowband technologies. And UWB looks to have very attractive power characteristics. It's extremely low-power, which is obviously beneficial in a mobile device.

There are already some applications people are looking at, although I don't know if any of them will take off. For instance, UWB can give you very specific positioning because it uses very sharp pulses.

CPU: So I could plant a UWB transmitter on a big game animal and track it throughout a park?

Kahn: Yes, because you can trade data rate for range. And for tracking, you don't have to transmit much information. You just really want the time signal. But most of all, it's about the short-range bandwidth. There are some people interested in using the 60GHz unlicensed band that could probably also achieve those kinds of data rates, but there are other reasons why getting up that high is tough. Another big advantage of UWB, though, is that it has a very easy CMOS implementation. It turns out to have pretty simple transmitter/receiver structures, so it looks like the kind of device that companies can integrate onto other devices or chips pretty easily.

CPU: Will UWB cost more or less to implement than, say, Bluetooth?

Kahn: We haven't characterized the actual cost at this point.

CPU: What do you hope that UWB will be used for in the future?

Kahn: The place where it fits in the future is a personal-area serial connect of some sort. Think of it as USB 2.0 without the wires. Bluetooth will give you hundreds of kilobits per second, but there are lots of applications where that's just not fast enough to make it interesting. Think about the guy with a digital camera, and you want to have kiosks where you can quickly upload your pictures to the 'Net. Well, if I'm going to transfer a whole card full of images that are 2MB to 3MB each, it's got to happen pretty quick or people are going to get bored silly with the delay.

There are a bunch of applications like that that are very localized, high-speed networking problems. That's really where UWB is going to be at. Get rid of the wires around your PC. Get rid of the wires around a kiosk in the mall. Any of those types of things where the sender and receiver are only a few feet apart and what you want to be able to do is very high data rate stuff. Or there's the location application, where companies might want to use UWB for inventory management to help tag stuff in big warehouses. There are people looking at doing multiple hop applications, where you'd want to use UWB over longer distances while keeping the data rate up. So there are lots of other applications, but the one we're starting with is personal area networking.

CPU: How long until we see UWB products on store shelves?

Kahn: I think some of the startups will deliver products this year. At least, that's what they claim. Realistically? In the mainstream for an application you would care about, I'd say it's two to three years at least. **CPU**

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Under Development

A Peek At What's Brewing In The Laboratory

Fresh from the most influential R&D labs around the world, here's a glimpse at some of the technology that scientists, lab techs, and researchers are cooking up for the future.

Small Screen, Big Res

Today's small-format LCDs appear in Pocket PCs, smart phones, and even next-generation digital wristwatches. The problem with these devices is resolution. You can't exactly surf a graphics-rich site at 120 x 90. What you need is a 2-inch screen with VGA or better resolution. Microvision (www.mvis.com) may have the answer.

The company's new technology uses three LEDs (red, green, and blue) to shine light at a MEMS (micro-electromechanical systems) chip featuring a vibrating mirror. The mirror's motion bounces light into a lens, which then projects the image. The user holds the display up close to her eye to view the display at the full resolution. Prototype designs on microdisplays (less than 1.5 inches) have already yielded a 800 x 600 resolution with contrast ratios of 150:1, comparable to a low-end flat-panel monitor.

"The annual production volumes for these types of consumer devices can reach into the hundreds of millions very quickly," says Russell Hannigan, Microvision's director of business development for advanced products. "We believe the market for miniature displays will grow to tens of millions of units over the next



Part smart phone and part projector, concept devices, such as this handset from Microvision, would beam a conventional monitor's worth of screen information onto your retina when held close to your eye.

several years, but consumers will want inexpensive devices like mobile handsets and digital cameras to produce high-quality images."

Hannigan says Microvision's technology will be less expensive than traditional flat-panel technology at similar sizes and that "ultimately, it's all about pixels per penny."

Although LED projection is new in the handset-style microdisplays, it has really been in use since 1990 in Private Eye, which is a Microvision head-mounted display product. Private Eye uses full-color LEDs that work with a MEMS-mounted mirror to project images onto a glass panel suspended over one of the user's eyes, superimposing computer-generated graphics onto the real world. This "augmented reality" technology has as much potential for gamers and corporate

presenters as it does for the military, which is already using it to help ground troops.

Microvision's goal for the next two years is to make its display technology smaller, lighter, cheaper, and more power-efficient. ▲

Building In Security—With Concrete

In 1985, Dutch scientist Professor Wim van Eck wrote "Electromagnetic Radiation from Video Display Units: An Eavesdropping Risk." The paper was meant as a warning to scientific and security communities that all computer equipment displays in particular, emit electromagnetic radiation when in use—radiation a listener could pick up and tune in like a radio station with the proper equipment. The Feds had known this for 20 years and developed standards code-named: TEMPEST for blocking such emissions.

A casual online search reveals "TEMPEST-certified" products and "van Eck manuals" for the snoop and paranoid alike, but only federal officials and contractors are authorized to actually possess such monitoring equipment. Could it be that Big Brother is watching your chat sessions from a van across the street? Hypothetically, sure, especially with the current security over-liberty climate many perceive to exist on Capitol Hill.

There are ways to guard your privacy, however. You could wallpaper your room in lead, but a slightly more practical method is constructing a conductive concrete room. The National Research Council of Canada is investigating using carbon fibers as elements in large concrete slabs. Merely hook up leads to each end of the slab and you have built-in spy blocking. Heating elements have been used for deicing of concrete roads and walkways for years, but the process is expensive in most cases. A carbon-fiber process would serve duty for cold Canadian thoroughfares and conspiracy theorists alike.

Currently, carbon-fiber composite concrete is a reality. However, researchers are trying to devise less expensive manufacturing processes. Heat-refined coal particles and newer handling and curing processes are helping to bring costs down, but there's still much room for improvement before the average PC user is likely to be able to afford a spy-proof computing bunker. ▲

When Bad Dates Happen To Good Food

Some people obsess over expiration dates; others could care less. The debate over whether to chuck it or chew it may be nearing an end if University of California, Berkeley, assistant professor Dr. Vivek Subramanian has his way.

By monitoring chemical levels in foods, sensors can determine if food has gone bad. The trick is communicating that information, either to the package's outside or the local supermarket. Most sensors are made from silicon transistors, but manufacturing silicon chips is prohibitively expensive for use in a \$3.29 gallon of milk. Instead, Subramanian is working with organic transistors, such as those now being developed for use in OLEDs (organic LEDs).

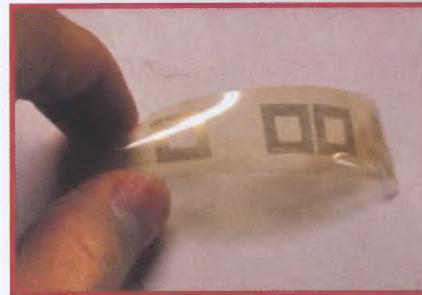
Ideally, organic transistors can be self-assembled in vast batches. Manufacturers just need to dip the substrate into a series of special-liquid solutions. As the material cools and solidifies, transistors form naturally. Subramanian's group is developing a special inkjet-type printer to spray these transistors into circuit patterns. Because organic transistors can be applied to flexible plastic rather than rigid silicon, practically any household object can have sensors and circuitry applied to it, including milk jugs and the inside of meat packages.

Subramanian hopes organic sensors will become as ubiquitous in food markets as theft sensors are in clothing shops. Adoption hinges on the circuits' abilities to communicate wirelessly with a home's network and alert the store that food is rotting or needs to be reordered. Such technologies may even be the missing link in enabling a strong online grocery industry. At the least, they'll spare you many an upset stomach. According to Subramanian, the problem is that organic circuitry is at the same development phase that silicon was in the 1960s and '70s, although he states the progress in organics will be faster.

"My group is focused on ultra-cheap RFID [Radio Frequency Identification] circuits to act as replacements for bar codes on consumer packages. To integrate such a technology on a 50-cent can of soup, we need to have an integrated price of a penny or so," says Subramanian. "We are several



This printer at Dr. Vivek Subramanian's lab prints organic transistors rather than ink. With these microscopic building blocks, he hopes to not only develop sensors that can detect gaseous emissions from food but also RF circuitry and other basic electronic devices.



Shown here are organic circuits on a flexible plastic substrate. The challenge facing Dr. Vivek Subramanian and his team at the University of California, Berkeley, is to enable wireless functionality in such circuits so everyday objects can network with larger systems in and outside the home.

years away from having fully functional research prototypes. But we are convinced that this is achievable at the cost points above." ▲

For \$500, the ER1 can utilize your old dust-gathering notebook to help guard your home, protect your health, sing you songs, and even fetch your beer.



Great Robot, But BYO Notebook

If you've ever dreamed of a semipractical robot doing your domestic bidding, Evolution Robotics (www.evolution.com) has your wake-up call. The ER1 is essentially a scaled-down, simplified robotic body with wheels, Web cam, flat platform, circuitry, and, later this year, robotic arm. You supply the central processor by plugging in a USB-enabled notebook.

At the heart of ER1's genius is object recognition rather than the more conventional approach of using coordinates to navigate a floor space. The ER1 can remember images, such as the view from a doorway, and correlate these with a memorized floor plan for more efficient mobility.

ER1's object recognition can be tied to numerous functions. Say you record a chapter of a book as an MP3 file and teach ER1 to associate an image of the book's cover with the file. Flash the book at ER1's camera (even at an angle and upside down), and the robot can read the first chapter aloud. Unlike other systems, the ER1 doesn't rely on complex coding to create routines, only simple if-then statements.

The ER1 platform is capable of text and speech recognition, but Evolution doesn't provide software out of the box in its entry-level robot. Each object is recognized by as many as 1,000 different characteristics, and the recognition tolerance can be adjusted to suit the situation. For example, you might want better accuracy in matching facial expressions (which can also trigger events) than matching cars vs. buses.

"You can train the robot to recognize tens of thousands of objects," says Jennifer McNally, Evolution senior director of marketing. "We believe there's now enough processing power and software development on the market to get robotics out of the lab and into the home."

Evolution's software is upgradeable, and the company sells a robotics development kit to application developers. Future uses might include watching over an elderly user. If the person falls and doesn't get up, ER1 could use its 802.11 connection to email for help or beam live video to a rescue service. ▲

Q&A With Bjarne Stroustrup

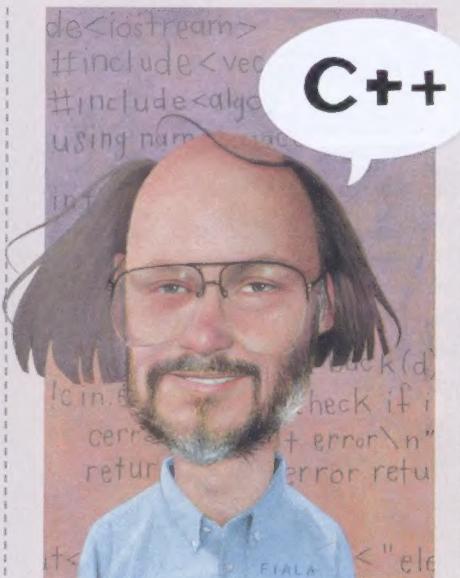
Many times when you see a successful product or standard, a behind-the-scenes device is at least partly responsible. The C++ programming language, which Danish programmer Bjarne Stroustrup developed while at AT&T in the early 1980s, is one of those behind-the-scenes devices. C++ is a driving force for many technological and computing advances and products in the past 20 years. Stroustrup, who remains a computer scientist with AT&T Labs and is head of the Large-Scale Programming Research department, recently discussed several aspects of the C++ language with *CPU*.

Q It seems as though recent changes to C and C++ are driving the two languages further apart. Is this a good thing? Or would you like to see the languages move closer together?

STROUSTRUP: I would like to see the languages merged. I don't see a philosophical reason not to. I see many practical advantages for the user community from removing incompatibilities, and though a merger would be technically difficult, I consider it technically feasible. Whether it is politically feasible is another matter. There are people who would contradict every statement in my answer. I'll soon be putting a paper discussing the relationship between C and C++ on my home page [www.research.att.com/~bs/homepage.html].

Q Why do you think C++ remains so popular? After developing the language, did you expect to still be talking about C++ 20 years later?

STROUSTRUP: C++ has amazing expressive power, and many people do know how to use it. Much of today's computing, communications, and commercial infrastructure is C++: for example, Google, Internet Explorer, Photoshop, and critical parts of your phone system. There is a reason for



that, and it's not that C++ had the inside track as a proprietary language with superior marketing clout. When developing C++, I was too busy [to think] about anything except how to make it as good as I knew how to and to teach it to anyone who cared to listen or read. If I had thought about it, I guess I would have thought that in 20 years everybody would understand the principles, facilities, and techniques, so that then there would have been no need for me to talk about C++. I would have been very wrong.

Q Everyone asks what you would do differently if you could redesign the language. But I'd like to know what features you think were especially good and successful in the original C++ design, features that you'd never change.

STROUSTRUP: They certainly do (laughing). C++ is focused on classes. A class is meant for expressing a concept. To do that well, a C++ class is a very general and flexible construct. My idea was to make the facilities for defining and using classes so general and flexible that I didn't need to introduce special-purpose facilities. Thus, in C++, a vector is a class, a list is a class, a string is a class, a resource handle can be a class, a thread

can be a class, etc. Where other languages have built-in facilities, C++ relies on user-defined classes. The C++ standard library is written in Standard C++. I see class hierarchies and parameterized classes as consequences of wanting general and flexible classes. In the unlikely event that I should design another language, I'd try to strengthen that view. More to the point, I am trying to make that view central to the upcoming revision of the C++ standard.

Q What has been the most important change to C++ over the years?

STROUSTRUP: The addition of templates. The notion of parameterized containers was part of my original conception of a language supporting abstraction. I just didn't know how to design them to be flexible enough and efficient enough until 1988 or so. Improvements in that area continue; generic programming is one of the most active areas of experimentation with C++.

Q What sparked your desire to design C++? Are those ideas still relevant as the language evolves?

STROUSTRUP: My main aim with C++ was to be able to express ideas directly in code and have that code execute with close-to-optimal performance. In other words, to write programs that were both elegant and efficient. That's still my aim, and C++ allows me to do that in many areas that interest me. In particular, I still experiment with distributed systems.

For our complete interview with Bjarne Stroustrup, go to www.smartcomputing.com/cpumag/aug02/stroustrup.

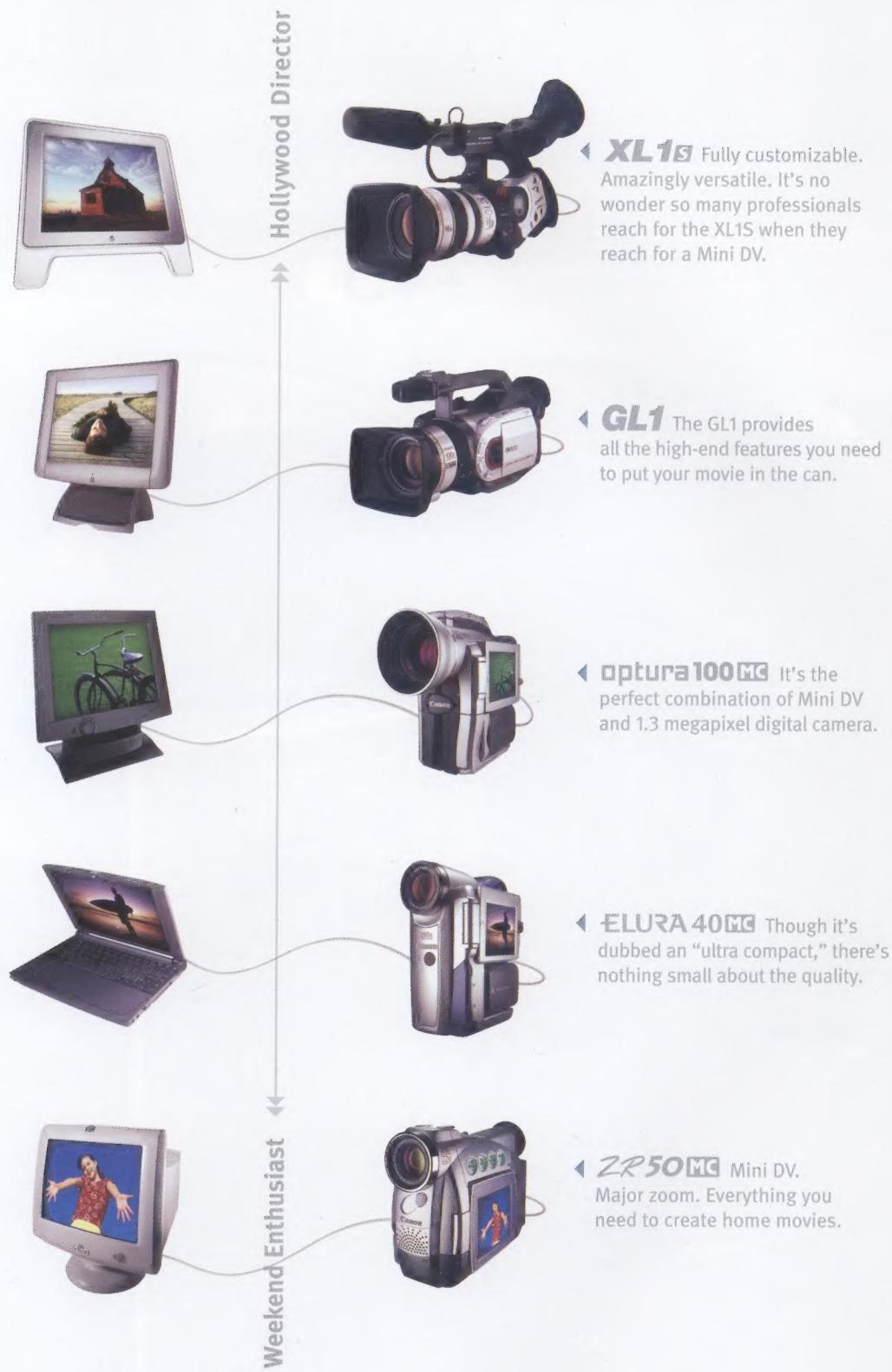
Kyle Schurman has been writing about computers and the computing industry for Smart Computing and CPU magazines for nearly 10 years.





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